

Part II. List of Other Arthropod Pheromones and Allomones

Update: Jan. 4, 2025

(A) Terpenoid Compounds

These semiochemicals are divided into the following five groups and listed in ascending order of carbon chain length or ring size.

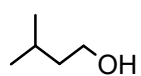
- | | | | |
|---------|---------------------------------|--------|-----------------|
| [A-1] | Terpene: Acyclic compounds | i – x | (191 compounds) |
| [A-2] | Terpene: Small ring compounds | i – v | (98 compounds) |
| [A-3] | Terpene: Large ring compounds | i – ii | (17 compounds) |
| [A-4] | Terpene: Fused-ring compounds | i – x | (150 compounds) |
| [A-5] | Terpene: Heterocyclic compounds | i – ii | (34 compounds) |

See the database, <https://lepipheromone.sakura.ne.jp/mepdb.html>, for more information, such as the IUPAC names, arthropod species names, and research publications

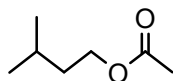
Lepidopteran female sex pheromones and male attractants are listed in **Part I**. Other arthropod pheromones and allomones are listed in **Part II**, which is composed of **(A)** terpenoid compounds without alkaloids, **(B)** non-terpene methyl-branched compounds, and **(C)** other compounds including terpene alkaloids.

[A-1] Terpene: Acyclic comp. (i)

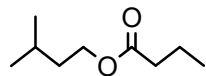
C5 (C4 chain)



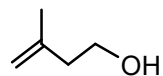
wasp (alarm phe.)
ambrosia beetle
(M aggregation
phe.), water beetle
(allomone ?)



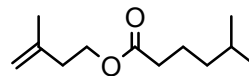
honey bee
(worker
alarm phe.)



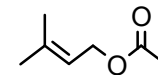
true bug
(aggregation phe.
kairomone)



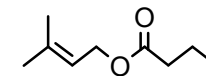
bark beetle
(aggregation
phe.)



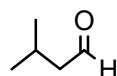
mealybug
(F sex phe.)



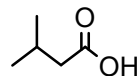
honey bee (alarm phe.)
fruit fly (M gland
secretion)



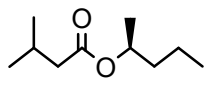
true bug
(aggregation phe.)



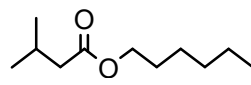
rove beetle,
ground beetle
(allomone ?)



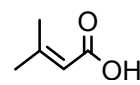
rove beetle
(allomone), ant
(gland secretion)



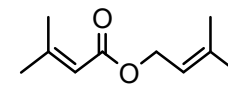
wasp
(alarm phe.)



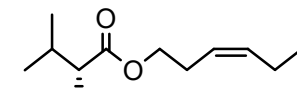
butterfly
(gland secretion)



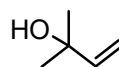
cockroach
(M sex phe.)



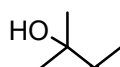
wasp (alarm phe. ?)



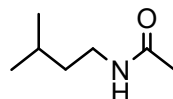
assassin bug
(aggregation phe.)



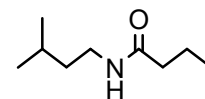
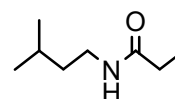
bark beetle
(aggregation phe.)
wasp (alarm phe.)
assassin bug (sex phe.?)



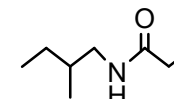
bark beetle,
parasitoid wasp
(aggregation phe.)



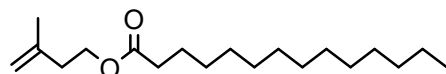
wasp, cockroach (alarm phe.)
fruit fly (M sex phe.)
green lacewing (gland secretion)



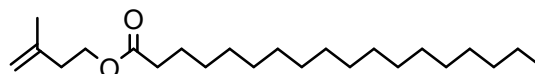
wasp (alarm phe.)



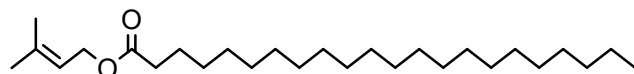
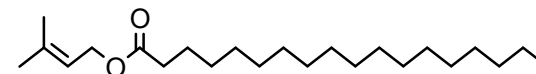
fruit fly (M sex phe.)



wasp (M marking phe. ?)



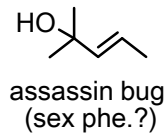
sweat bee (gland secretion)



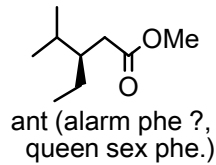
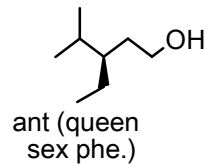
sweat bee (gland secretion)

[A-1] Terpene: Acyclic comp. (ii)

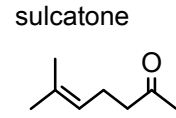
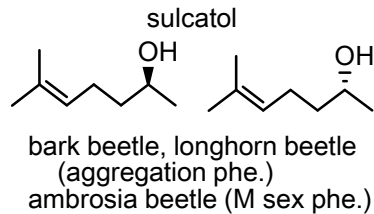
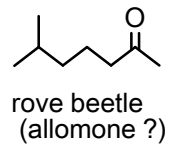
C6 (C5 chain)



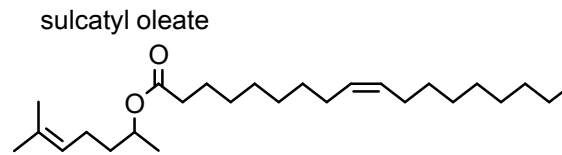
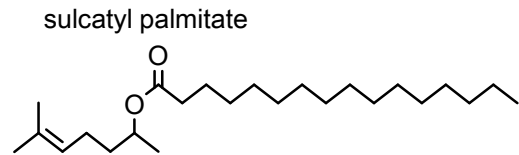
C8 (C5 chain)



C8 (C7 chain)

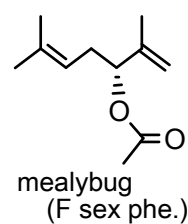
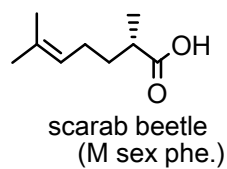
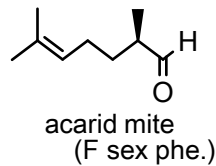
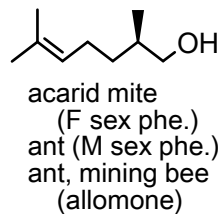


rove beetle, leaf beetle, butterfly, water beetle,
parasitoid wasp, harvestman (allomone)
rove beetle, ant (alarm phe.), stingless bee (kairomone)
aphid, parasitoid wasp (spacing phe.),
moth, butterfly, ambrosia beetle (M sex phe.)
spider, parasitoid wasp (F sex phe.)
moth (larva aggregation phe.), weevil (M aggregation phe.)

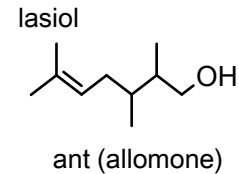


butterfly (allomone)

C9 (C7 chain)



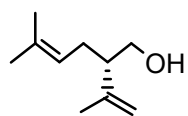
C10 (C7 chain)



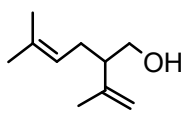
[A-1] Terpene: Acyclic comp. (iii)

C10 (C6 chain)

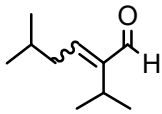
lavandulol



mealybug
(F sex phe.)

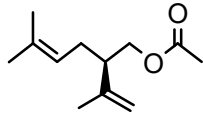


carrion beetle
(allomone)

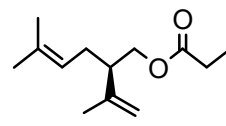


ant (alarm phe.)

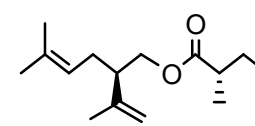
lavandulyl acetate



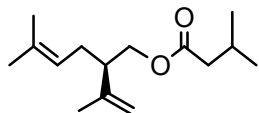
mealybug (F sex phe.)
thrips (aggregation phe.)



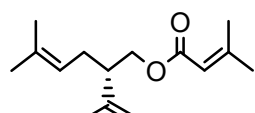
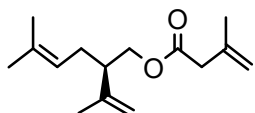
mealybug (F sex phe.)



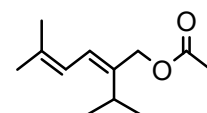
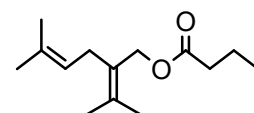
fujikonyl butylate



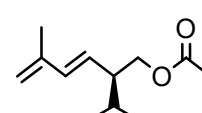
thrips (aggregation phe.)



mealybug (F sex phe.)

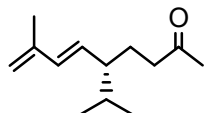


mealybug (F sex phe.)



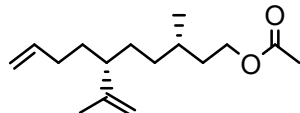
C13 (C9 chain)

solanone

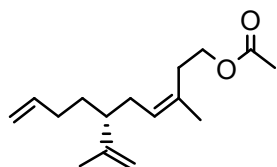


scale (F sex phe.)

C14 (C10 chain)

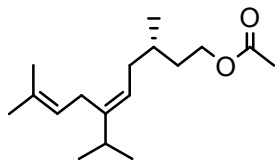


scale (F sex phe.)

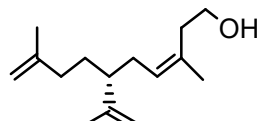


C15 (C10 chain)

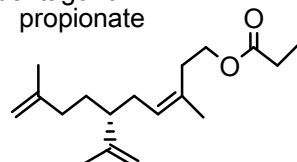
pentagonol



scale (F sex phe.)



pentagonol
propionate

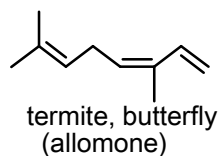


scale (F sex phe.)

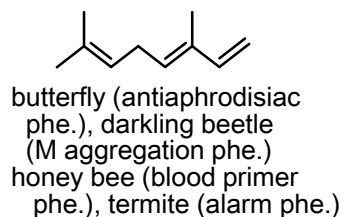
[A-1] Terpene: Acyclic comp. (iv)

C10 (C8 chain)

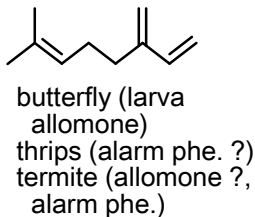
Z- β -ocimene



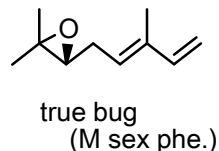
E- β -ocimene



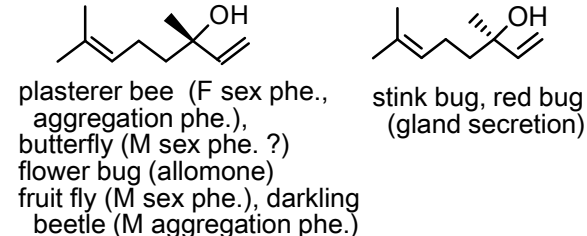
β -myrcene



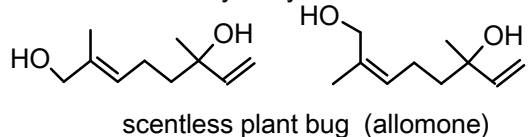
ocimene epoxide



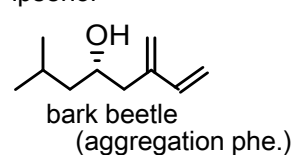
linalool



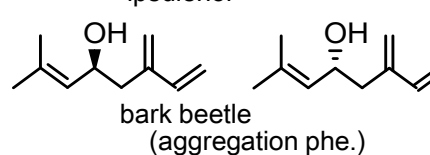
8-hydroxylinalool



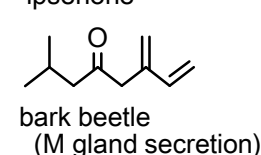
ipsenol



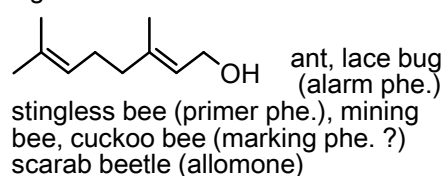
ipsdienol



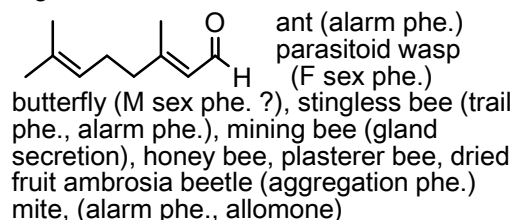
ipsenone



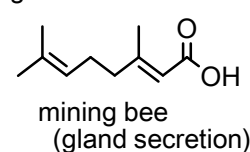
geraniol



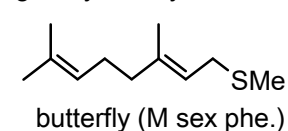
geranial



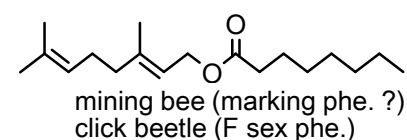
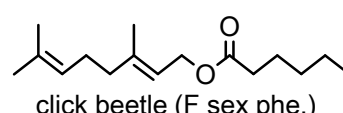
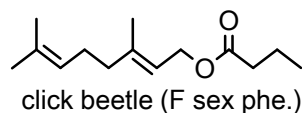
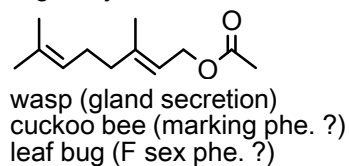
geranic acid



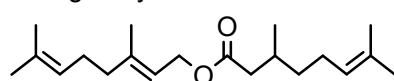
geranyl methyl thioether



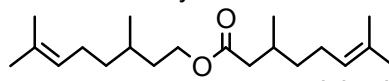
geranyl acetate



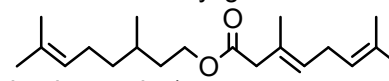
geranyl citronellate



citronellyl citronellate

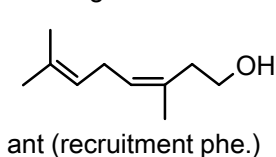


citronellyl geranate

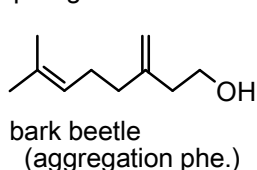


mining bee (gland secretion)

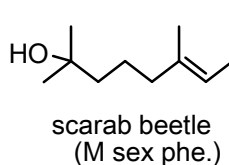
Z-isogeraniol



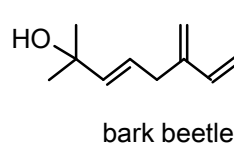
γ -isogeraniol



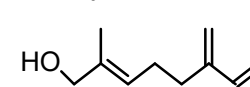
E-subaeneol



isomyrcenol (amitinol)



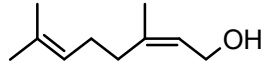
E-myrcenol



[A-1] Terpene: Acyclic comp. (v)

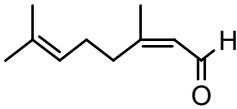
C10 (C8 chain)

nerol



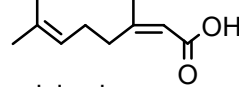
ant, stingless bee
(alarm phe.)
honey bee
(trail phe.)

neral



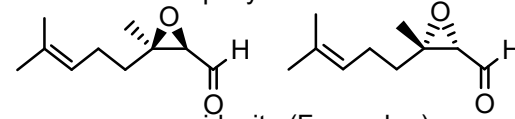
ant (alarm phe.)
parasitoid wasp
(F sex phe.)
butterfly (M sex phe.)
stingless bee (trail phe., alarm phe.), mining
bee (gland secretion), honey bee, plasterer
bee, dried fruit ambrosia beetle (aggregation
phe.), mite (alarm phe., allomone)

nerolic acid



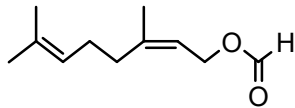
mining bee
(gland secretion)
ant (trail phe.)

epoxyneral



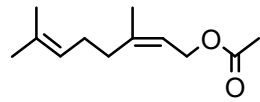
acarid mite (F sex phe.)

neryl formate

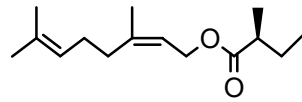


acarid mite (alarm phe.)

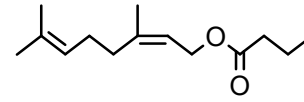
neryl acetate



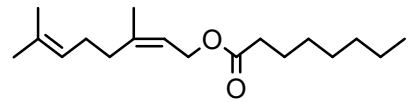
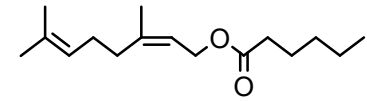
leaf bug (F sex phe. ?)



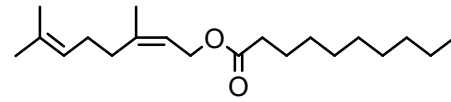
thrips (aggregation phe.)



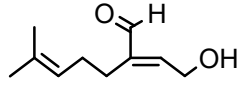
click beetle (F sex phe.)



click beetle (F sex phe.)

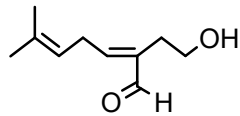


α -acaridolal

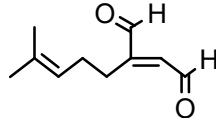


acarid mite (gland secretion)

β -acaridolal

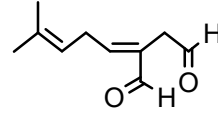


α -acaridial



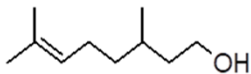
acarid mite (F sex phe.,
gland secretion)
thrips (allomone ?)

β -acaridial



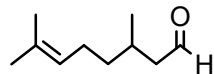
acarid mite (F sex phe.,
alarm phe., aggregation
phe., gland secretion)
thrips (allomone ?)

citronellol



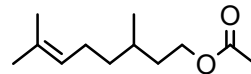
spider mite (F sex phe.)
mining bee (marking phe. ?)
bumblebee (M sex phe)

citronellal

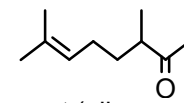


ant (secretion, alarm phe.)
rove beetle (allomone ?)

citronellyl acetate



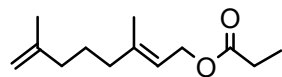
cuckoo bee
(gland secretion)



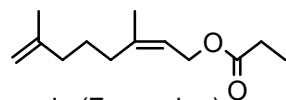
ant (allomone ?)

[A-1] Terpene: Acyclic comp. (vi)

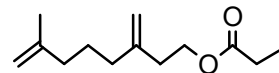
C10 (C8 chain)



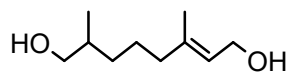
scale (F sex phe.)



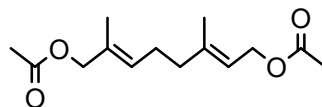
scale (F sex phe.)



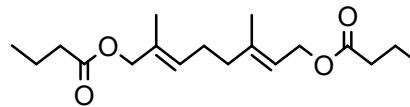
scale (F sex phe.)



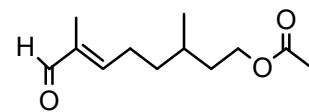
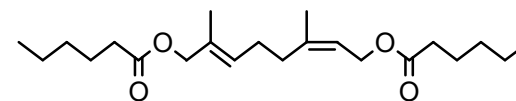
butterfly (M sex phe.)



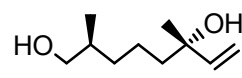
stink bug (M sex phe.)



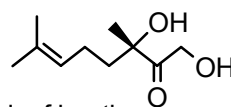
click beetle (F sex phe.)



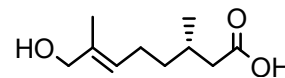
rove beetle (allomone)



parasitoid wasp
(M sex phe.)

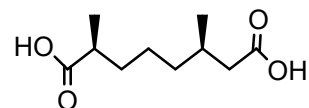


leaf beetle
(aggregation phe.)

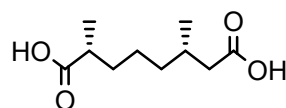


ant (allomone ?)

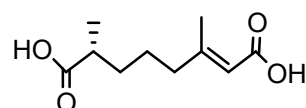
callosobruchusic acid



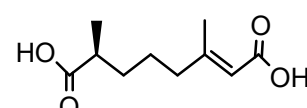
leaf beetle (F sex phe.)



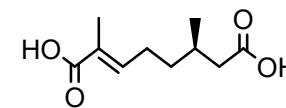
leaf beetle (F sex phe.)



leaf beetle (F sex phe.)



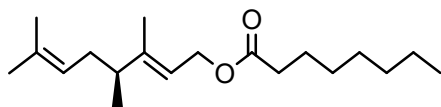
leaf beetle (F sex phe.)



ant (allomone ?)

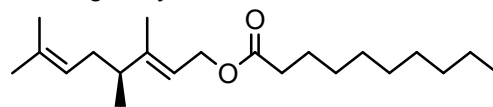
C11 (C8)

Me4-geranyl octanoate



ant (trail phe.)

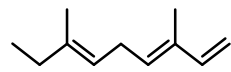
Me4-geranyl decanoate



ant (trail phe.)

C11 (C9)

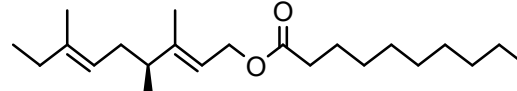
homocimene



ant (allomone ?)

C12 (C9)

bishomogeranyl decanoate

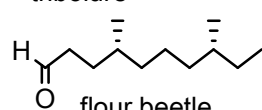


ant (trail phe.)

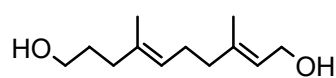
[A-1] Terpene: Acyclic comp. (vii)

C12 (C10 chain)

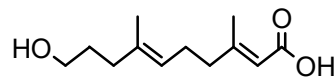
tribolure



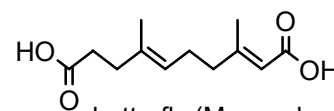
flour beetle
(aggregation phe.)



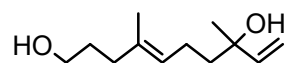
butterfly (M sex phe.)
mining bee (M gland secretion)



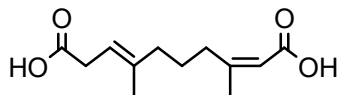
butterfly (M sex phe.)



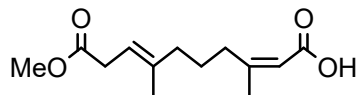
butterfly (M sex phe.)



butterfly (M sex phe.)



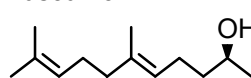
wasp (queen phe.)



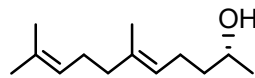
wasp (queen phe.)

C13 (C11 chain)

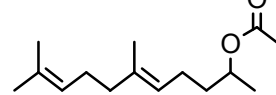
fuscumol



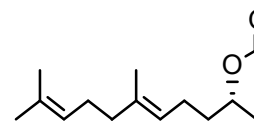
longhorn beetle (aggregation phe.)



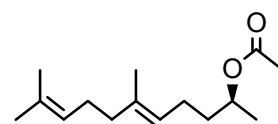
fuscumol acetate



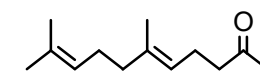
wasp (alarm phe.)



longhorn beetle (aggregation phe.)

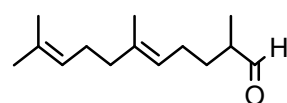


geranyl acetone

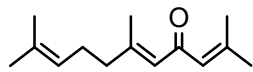


wasp (alarm phe.)
cuckoo bee (secretion)
burying beetle
long horn beetle
(aggregation phe.)
butterfly (M sex phe. ?)
tortrix moth (aggregation
(larva aggregation phr.)

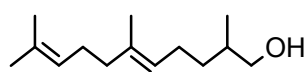
C14 (C11 chain)



termite (F sex phe.)

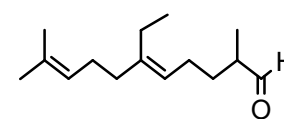


cuckoo bee (allomone)



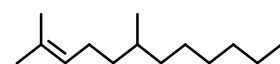
termite (trail phe.)

C15 (C11 chain)



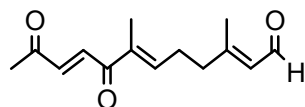
seed beetle (F sex phe.)

C14 (C12 chain)



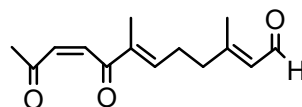
ant (guween
gland secretion)

gyrinidal



water beetle (allomone)

isogyridal

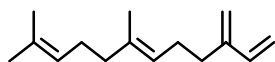


water beetle (allomone)

[A-1] Terpene: Acyclic comp. (viii)

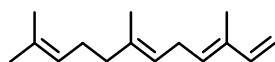
C15 (C12 chain)

E, β -farnesene



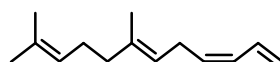
aphid (alarm phe.)
ant (gland secretion)
fruit fly (M aggregation phe.)
butterfly (allomone,
M sex phe. ?)

E,*E*- α -farnesene



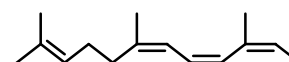
fruit fly, swift moth, butterfly,
seed beetle (M sex phe.)
emerald moth (F sex phe.)
longhorn beetle (M aggregation
phe.), termite (alarm phe.)

Z,*E*- α -farnesene

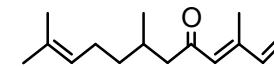


ant (trail phe., marking phe.)
aphid (alarm phe. ?), fruit fly,
seed beetle (M sex phe.)
termite, click beetle (F sex phe.)
seed bug (gland secretion)

Z,*Z*,*Z*-allofarnesene

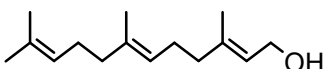


ant (trail phe.)



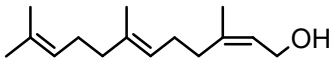
cuckoo bee (allomone)

E,*E*-farnesol



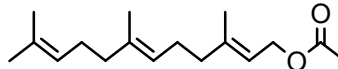
bumblebee (marking phe.)
honey bee (trail phe.)
cuckoo bee (gland secretion)
click beetle (F sex phe.)

Z,*E*-farnesol

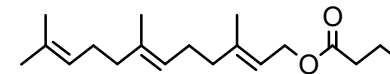


spider mite (F sex phe.)

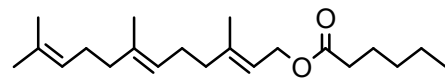
farnesyl acetate



click beetle, spider
(F sex phe.)

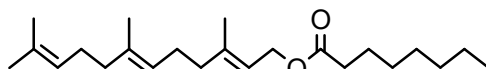


click beetle (F sex phe.)
stingless bee (trail phe. ?)



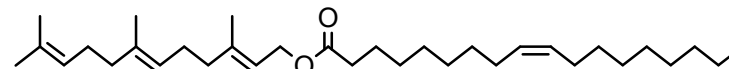
mining bee (marking phe. ?)
click beetle (F sex phe.)

farnesyl octanoate



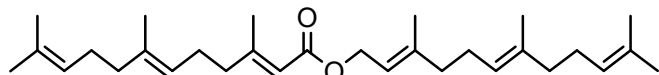
mining bee (F gland secretion)

farnesyl oleate



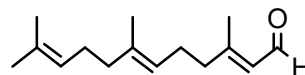
bumblebee (gyne sex phe. ?)

farnesyl farnesoate



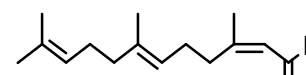
centipede (gland secretion)

E,*E*-farnesal

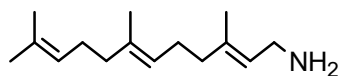


termite (allomone ?)
pyralid moth (M sex phe.)
cuckoo bee, oribatid mite
(gland secretion)

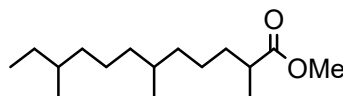
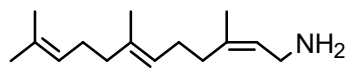
Z,*E*-farnesal



termite (allomone ?)
pyralid moth (M sex phe.)
cuckoo bee, oribatid mite
(gland secretion)



ant (gland secretion)

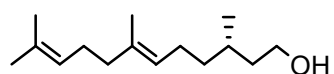


stink bug (M sex phe.)

[A-1] Terpene: Acyclic comp. (ix)

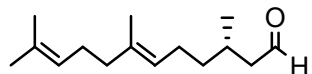
C15 (C12 chain)

2,3-dihydrofarnesol



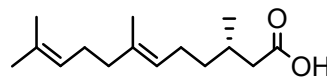
bumblebee (marking phe.)

2,3-dihydrofarnesal

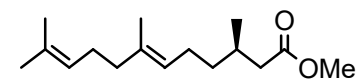


bumblebee (marking phe.)

2,3-dihydrofarnesoic acid

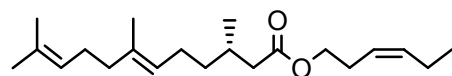


wasp (marking phe.)

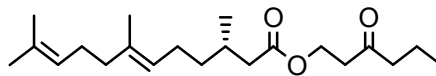


stink bug (M sex phe.)
click beetle (F sex phe.)

farnesyl 2,3-dihydrofarnesoate

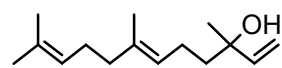


butterfly (gland secretion)

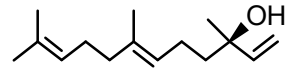


centipede (gland secretion)

E-nerolidol

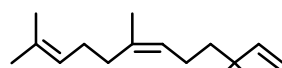


scarab, butterfly
(M sex phe.)
ant (gland secretion)



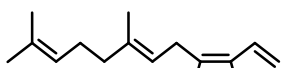
true bug (gland secretion)
termite (queen phe.)

Z-nerolidol



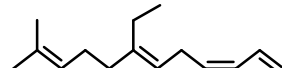
C16 (C12 chain)

Z,E- α -homofarnesene

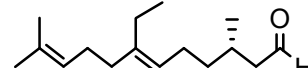


ant (trail phe.)

Z,E-homofarnesene

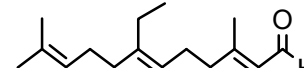


ant (marking phe.)

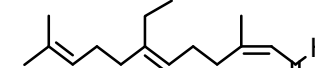


seed beetle (F sex phe.)

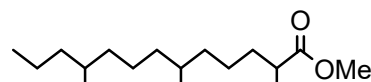
homofarnesal



seed beetle (F sex phe.)



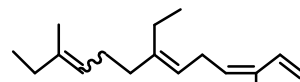
C16 (C13 chain)



stink bug (M sex phe.)

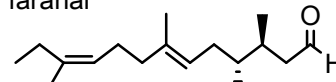
C17 (C13 chain)

bishomofarnesene



ant (marking phe.)

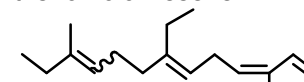
faranal



ant (trail phe.)

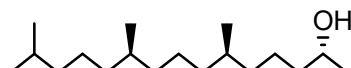
C18 (C13 chain)

trishomofarnesene



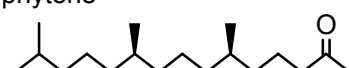
ant (gland secretion)

C18 (C15 chain)



butterfly (M sex phe.)
pyralid moth (F sex phe.)

phytone

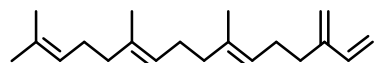


butterfly, orchid bee (M sex phe.)
pyralid moth (F and M sex phe.)
seed beetle (F sex phe.)

[A-1] Terpene: Acyclic comp. (X)

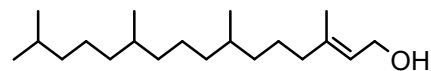
C20 (C16 chain)

β -springene



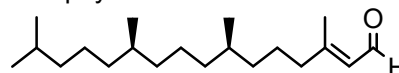
bumblebee (M gland secretion)

phytol



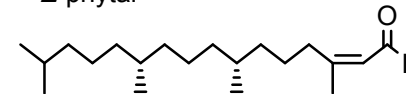
pyralid moth (M sex phe.)

E-phytal



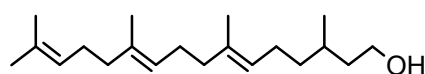
grasshopper (aggregation phe.)

Z-phytal



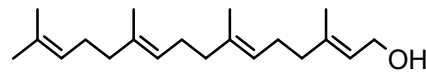
butterfly (M sex phe. ?)

geranylcitronellol



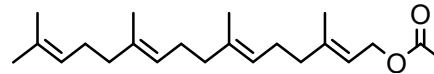
bumblebee (M gland secretion, marking phe. ?)

geranylgeraniol



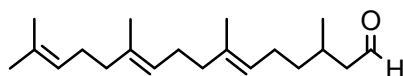
bumblebee (M marking phe.)
cuckoo bee (M gland secretion)
ant (alarm phe.)

geranylgeranyl acetate



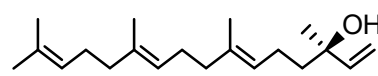
bumblebee, wasp (M marking phe.?)
bumblebee (gland secretion)
ant (trail phe.)

geranylcitronellal



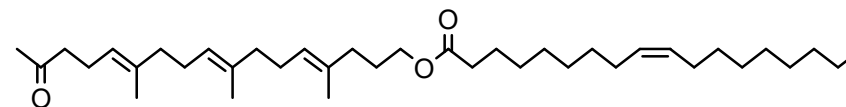
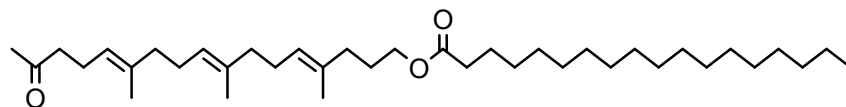
ant (gland secretion)

geranylinalool



termite (allomone)

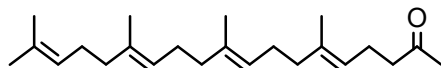
C20 (C17 chain)



butterfly (M anti-aphrodisiac phe. ?)

C23 (C19 chain)

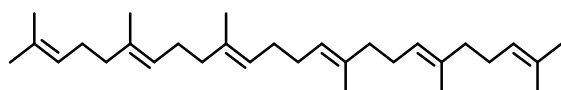
geranylgeranyl acetone



butterfly (M sex phe. ?)

C30 (C24 chain)

squalene

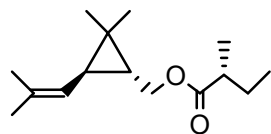


weevil (aggregation phe.)

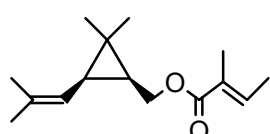
[A-2] Terpene: Small ring comp. (i)

C10 (C3 ring)

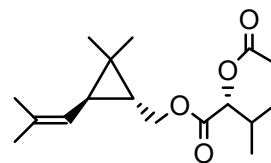
chrysanthemyl ester



mealybug (F sex phe.)



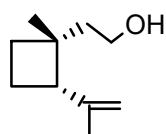
mealybug (F sex phe.)



mealybug (F sex phe.)

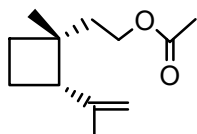
C10 (C4 ring)

grandisol (grandlure I)



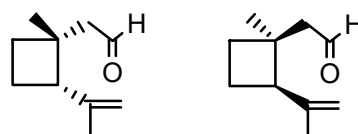
weevil, bark beetle
(aggregation phe.)
weevil M sex phe.)

grandisol acetate



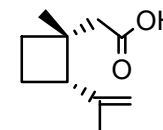
weevil (aggregation phe.)

grandisal



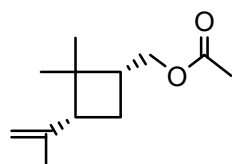
weevil (aggregation phe., M sex phe.)
weevil (aggregation phe.)

grandisoic acid

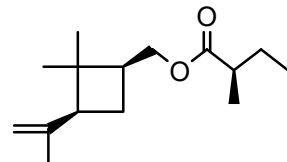


weevil (aggregation phe.)

planococcyll ester

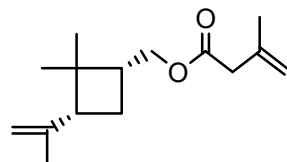


mealybug (F sex phe.)



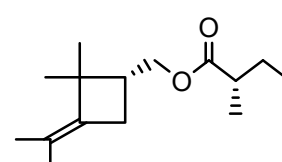
scale (F sex phe.)

cryptuslure

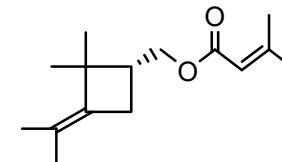


mealybug (F sex phe.)

maconelliyl ester



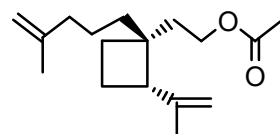
mealybug (F sex phe.)



mealybug (F sex phe.)

C15 (C4 ring)

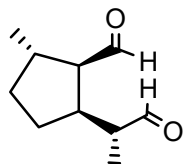
oleanderlure



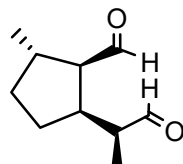
scale (F sex phe.)

[A-2] Terpene: Small ring comp. (ii)

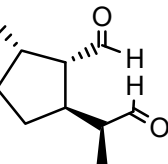
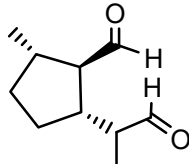
C10 (C5 ring)
iridodial



ant (allomone)
green lacewing
(aggregation phe.)

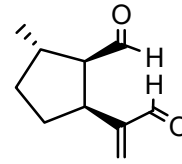


ant, longhorn beetle, rove beetle,
ground beetle (allomone)

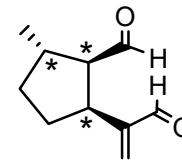


ant (allomone)

dolichodial

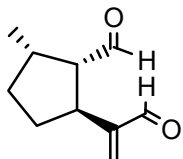


aphid (F sex phe.)



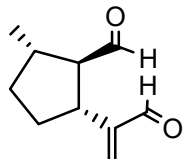
ant, sawfly, thrips,
rove beetle (allomone)

anisomorphal



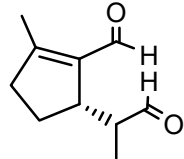
walking stick, ant
(allomone)

peruphasmal



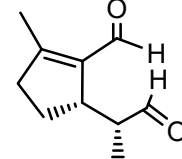
walking stick (allomone)
ant (trail phe.)

chrysolimial



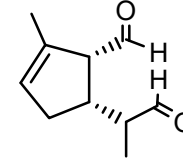
leaf beetle, oribotriiid
mite (allomone)

epi-chrysolimial

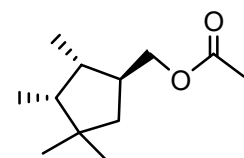


oribotriiid mite
(allomone ?)

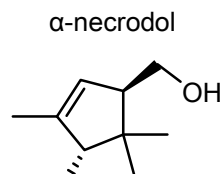
plagiodial



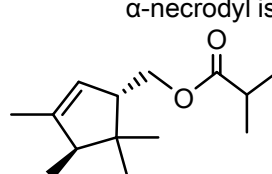
leaf beetle (allomone)



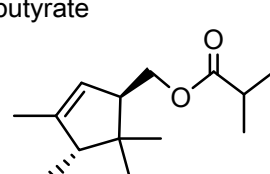
mealybug
(F sex phe.)



carrion beetle
(allomone)



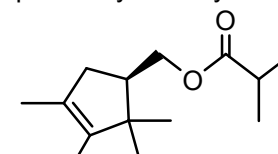
mealybug (F sex phe.)



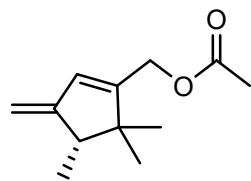
beta-necrodol

carrion beetle
(allomone)

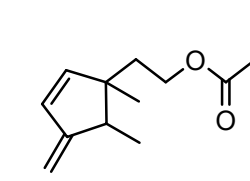
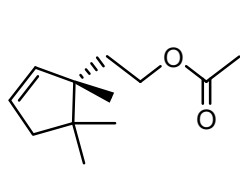
gamma-necrotyl isobutyrate



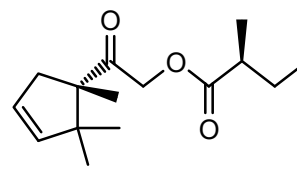
mealybug (F sex phe.)



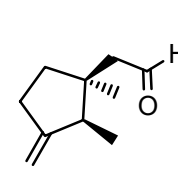
mealybug (F sex phe.)



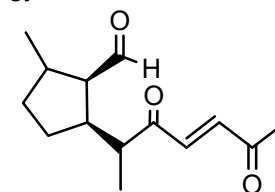
mealybug (F sex phe.)



mealybug (F sex phe.)



C14 (C5 ring)
gyrinidione

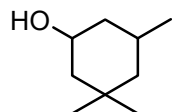


water beetle (allomone)

[A-2] Terpene: Small ring comp. (iii)

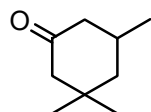
C9 (C6 ring)

cyclonol

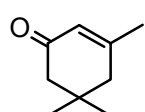


butterfly (gland secretion)

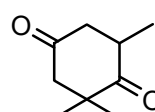
dihydroisophorone



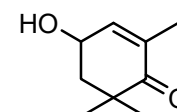
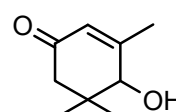
α -isophorone



bark beetle
(aggregation phe.)
butterfly (M sex phe.)

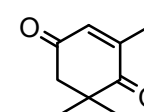


butterfly (M sex phe.)

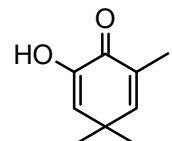


butterfly (M sex phe.)

oxoisophorone

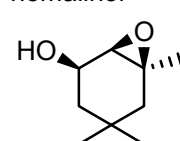


lanierone



bark beetle
(aggregation phe.)

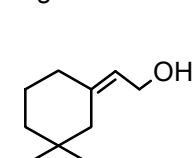
homalinol



weevil (M
aggregation phe.)

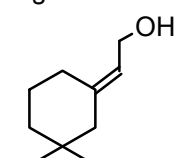
C10 (C6 ring)

Z grandlure II

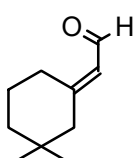


weevil (M aggregation phe.)

E grandlure II

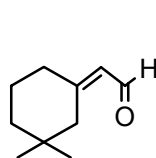


grandlure III

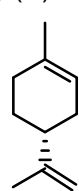


weevil (M aggregation phe.)

grandlure VI

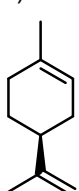


(+)-(R)-limonene



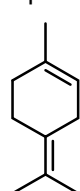
scentless plant bug, bark
beetle (gland secretion)
ground beetle (allomone)
darkling beetle (M
aggregation phe.)
ant (alarm phe.,
recruitment phe.)
termite (alarm phe.)
fruit fly (F sex phe.)

(-)-(S)-limonene



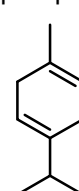
termite (alarm phe.)
ground beetle
(allomone)

terpinolene



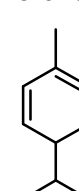
scentless plant bug,
ant (gland secretion)
termite, firefly
(allomone)

γ -terpinene



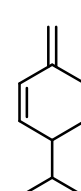
firefly (allomone)
ant (gland
secretion)

α -phellandrene



termite
(allomone ?)

β -phellandrene

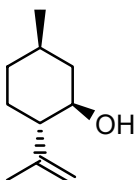


termite, butterfly,
leaf beetle
(allomone)

[A-2] Terpene: Small ring comp. (iv)

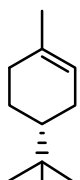
C10 (C6 ring)

isopulegol



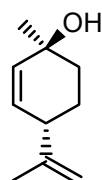
rove beetle
(allomone ?)

α -terpineol

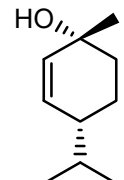


stink bug (M sex phe.)
flower bug (allomone)
weevil (M aggregation phe.)

quercivorol

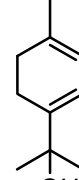


ambrosia beetle
(aggregation phe.)



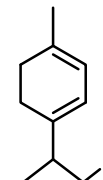
beetle (M aggregation phe.)

p-mentha-1,3-dien-8-ol

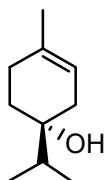


longhorned beetle
(M aggregation phe.)

p-mentha-1,3-dien-9-ol

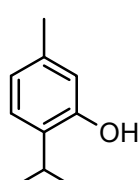


terpinen-4-ol



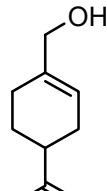
bark beetle
(aggregation phe.)

thymol

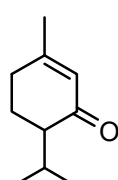


scentless plant bug (gland secretion)

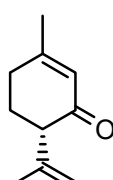
perillyl alcohol



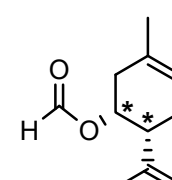
piperitone



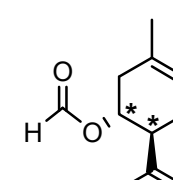
isopiperitenone



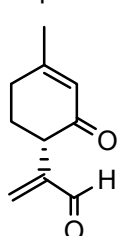
acarid mite (alarm phe., F sex phe.)



oribatid mite (gland secretion)

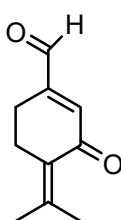


vesperal



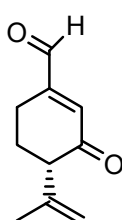
longhorn beetle
(F sex phe.)

robinal



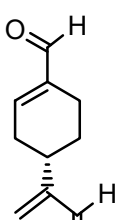
acarid mite
(gland secretion)

isorobinal



acarid mite
(F sex phe.)

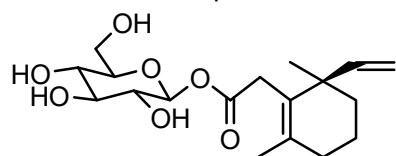
parectadial



walkingstick
(allomone)

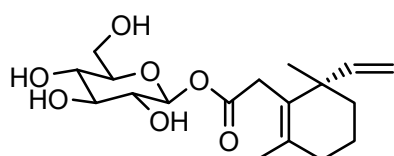
C12 (C6 ring)

suspensoside A



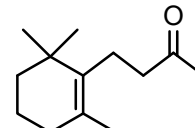
fruit fly (M sex phe.)

suspensoside B



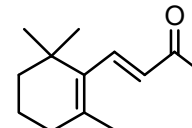
C13 (C6 ring)

dihydro- β -ionone

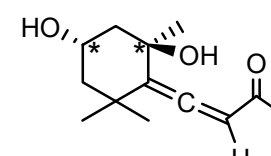


butterfly (gland secretion)

E- β -ionone



romallenone

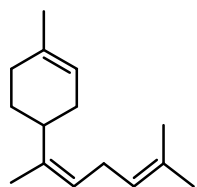


grasshopper (allomone)

[A-2] Terpene: Small ring comp. (v)

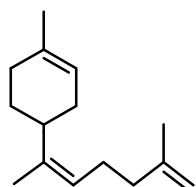
C15 (C6 ring)

α -bisabolene



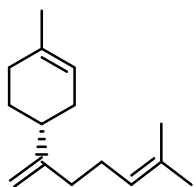
stink bug, fruit fly
(M sex phe.)
butterfly, termite
(allomone)

α_2 -bisabolene



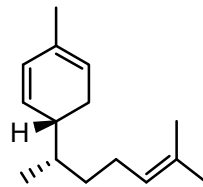
termite (allomone)

β -bisabolene



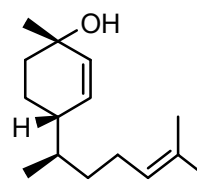
termite (allomone)
fruit fly (gland
secretion)

zingiberene

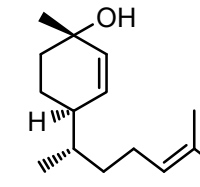
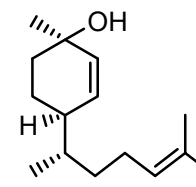


stink bug (M sex phe.)

zingiberenol

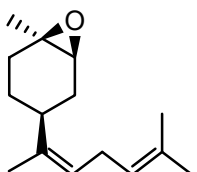


stink bug (M sex phe.)

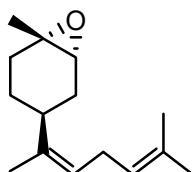


stink bug (M
aggregation phe.)

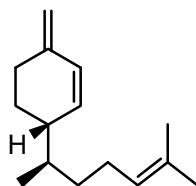
α -bisabolene epoxide



stink bug (M sex phe.)

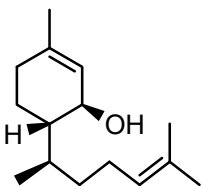


β -sesquiphellandrenel

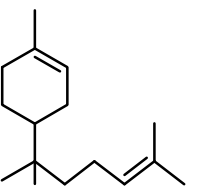


stink bug (M sex phe.)

sesquiperitol

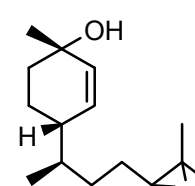


α -bisabolol

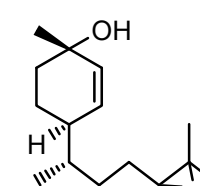


stink bug
(aggregation phe.)

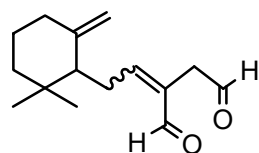
murgantiol



stink bug (M aggregation phe.,
M sex phe.)

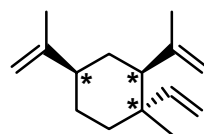


ancistrodial



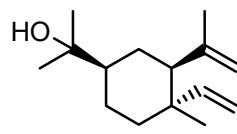
termite (allomone)

β -elemene



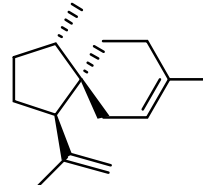
termite (gland secretion)
butterfly (allomone)

α -elemol



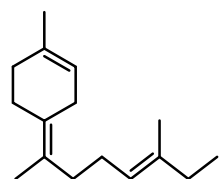
butterfly
(gland secretion)

α -acoradiene



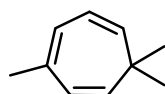
darkling beetle
(aggregation phe.)

C16 (C6 ring)



stink bug (M sex phe.)

C10 (C7 ring)

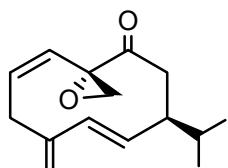


bark beetle
(gland secretion)

[A-3] Terpene: Large ring comp. (i)

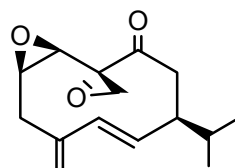
C15 (C10 ring)

periplanone A



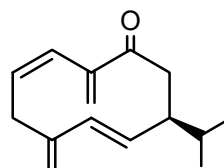
cockroach (F sex phe.)

periplanone B



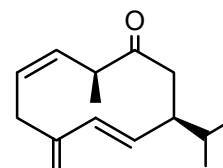
cockroach (F sex phe.)

periplanone C



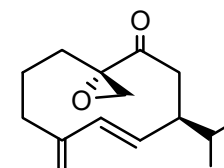
cockroach (F sex phe.)

periplanone D

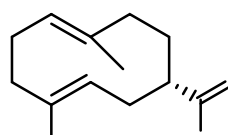


cockroach (F sex phe.)

periplanone J

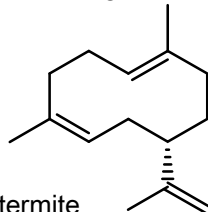


germacrene A

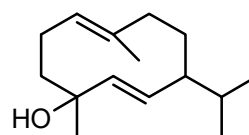


aphid (alarm phe.)
butterfly, termite
(allomone)

helminthogermacrene

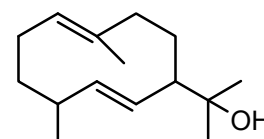


termite
(allomone)

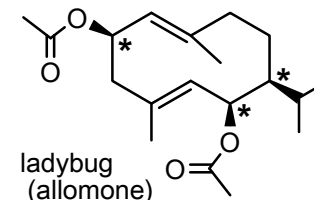


sawfly (allomone ?)

germacradienol



fungus gnat (F sex phe.)

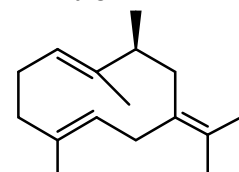


ladybug
(allomone)

cockroach (F sex phe.)

C16 (C10 ring)

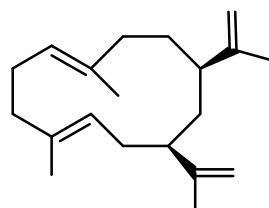
9-methylgermacrene B



sand fly (M sex phe.)

C20 (C12 ring)

cubitene

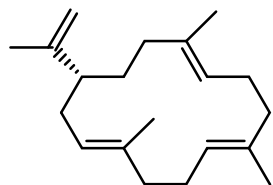


termite (allomone)

[A-3] Terpene: Large ring comp. (ii)

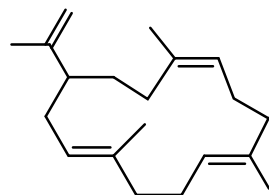
C20 (C14 ring)

cembrene A (neocembrene)



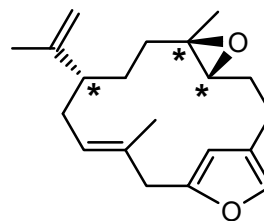
sand fly (M sex phe.)
termite (trail phe., allomone)

(3Z)-cembrene A

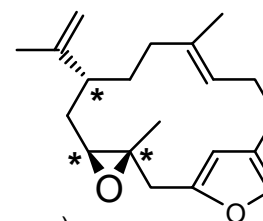


termite (allomone)

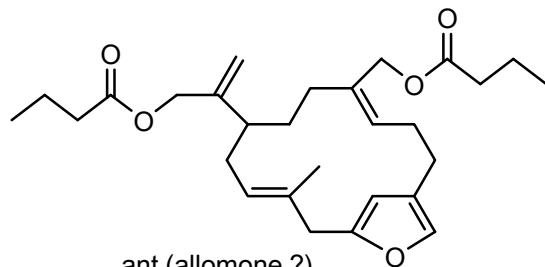
crematofuran



isocrematofuran



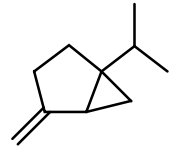
ant (allomone)



ant (allomone ?)

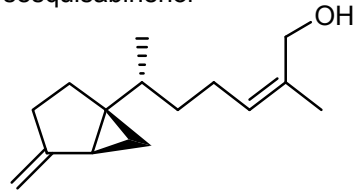
[A-4] Terpene: Fused-ring comp. (i)

C10 (C6 ring)
sabinene



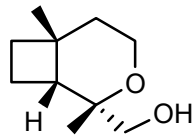
ant (gland secretion)
leaf beetle (allomone)
butterfly (larva allomone)

C15 (C6 ring)
sesquisabinenol



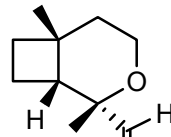
stink bug
(aggregation phe.)

C10 (C7 ring)
papayanol



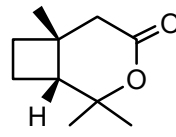
weevil
(aggregation phe.)

papayanal



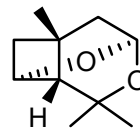
weevil
(aggregation phe.)

grandisolide



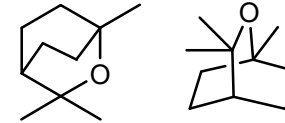
weevil
(aggregation phe.)

lineatin



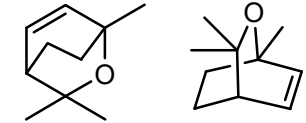
bark beetle
(aggregation phe.)

1,8-cineole (eucalyptol)



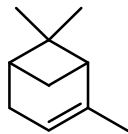
rove beetle, ground beetle,
seed bug (allomone)
bumblebee (recruitment)
mite (gland secretion)

dehydrocineole



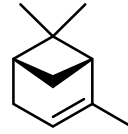
acarid mite, oribatid mite
(gland secretion)

α -pinene



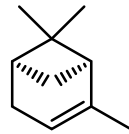
bark beetle
(aggregation phe.)
darkling beetle, ant,
termite, butterfly
(allomone)

(-)- α -pinene



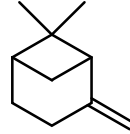
bark beetle
(aggregation phe.)
termite, aphid
(alarm phe.)
termite (allomone)

(+)- α -pinene



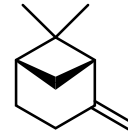
burrowing bug
(allomone)
termite (alarm
phe., allomone)

β -pinene



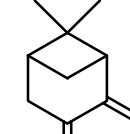
ant (alarm phe.)
millipede
(allomone)

(-)- β -pinene



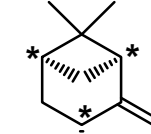
burrowing bug,
termite (allomone)
aphid, termite
(alarm phe.)

pinocarvone



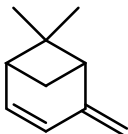
noctuid moth,
bark beetle (M
gland secretion)

trans-pinocarveol



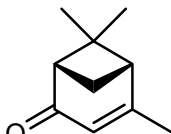
bark beetle (F
gland secretion)

verbenene

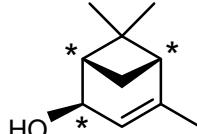


bark beetle (aggregation phe.)

verbenone

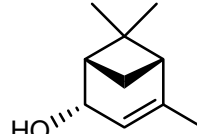


trans-verbenol

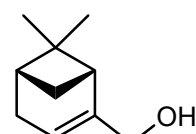


bark beetle (aggregation phe.)

cis-verbenol

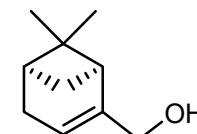


(-)-myrtenol



bark beetle (aggregation phe.)

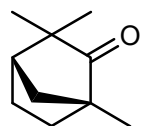
(+)-myrtenol



[A-4] Terpene: Fused-ring comp. (ii)

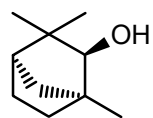
C10 (C7 ring)

fenchone



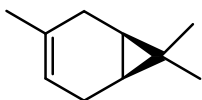
bark beetle
(kairomone)

(-)- β -fenchol



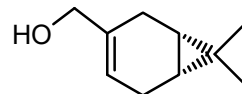
fruit fly (gland secretion)

3-carene



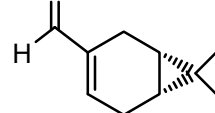
termite (alarm phe.,
allomone)

3-carene-10-ol



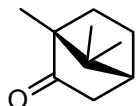
bark beetle
(aggregation phe.)

3-carene-10-al



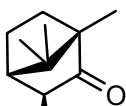
sawfly (allomone ?)

camphor



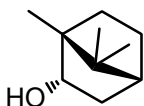
shield bug
(M sex phe.)

hydroxycamphor



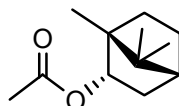
firefly
(F sex phe.)

borneol



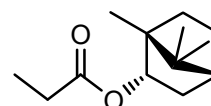
sawfly (allomone ?)
shield bug
(M sex phe.)

bornyl acetate



harvestman,
sawfly (allomone ?)

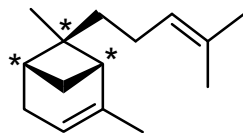
bornyl propionate



harvestman,
(allomone ?)

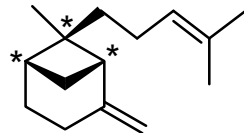
C15 (C7)

α -*trans*-bergamotene



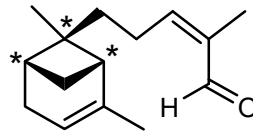
fruit fly (gland secretion)
wasp, true bug
(M sex phe.)

β -*trans*-bergamotene



wasp (M sex phe.)

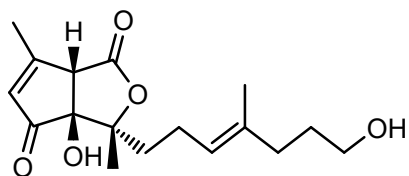
bergamotenal



stink bug (M sex phe.)

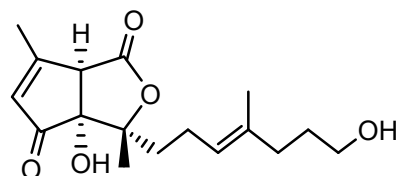
C17 (C7 ring)

gomadalactone A

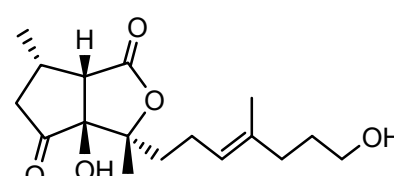


longhorn beetle (F sex phe.)

gomadalactone B



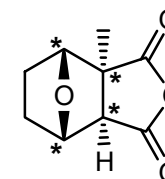
gomadalactone C



longhorn beetle (F sex phe.)

C9 (C8 ring)

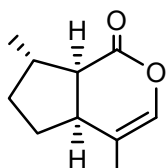
palasonin



blister beetle, rove beetle
checkered beetle
(allomone)

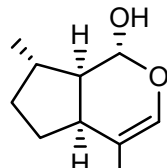
[A-4] Terpene: Fused-ring comp. (iii)

C10 (C8 ring)
nepetalactone

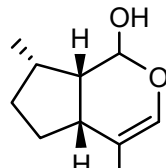


aphid (F sex phe.)

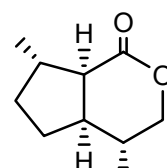
nepetalactol



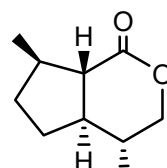
aphid (F sex phe.)



dihyronepetalactone

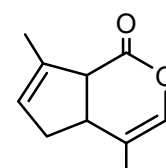


ant (allomone)



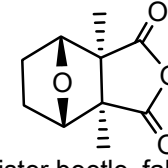
parasitoid wasp
(allomone)

gastrolactone



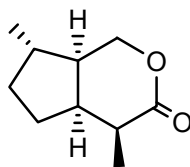
leaf beetle
(allomone)

cantharidin



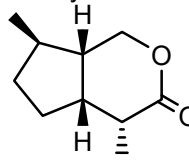
blister beetle, false blister
beetle *etc.* (allomone)
biting midge
(aggregation phe.)

iridomyrmecin

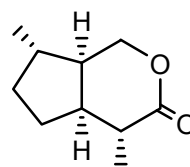


parasitoid wasp (allomone)
ant (allomone,
trail phe.)

epi-
iridomyrmecin

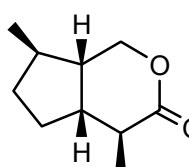


isoiridomyrmecin

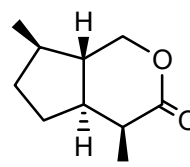
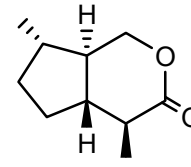


ant (allomone)

epi-
isoiridomyrmecin

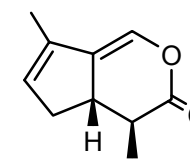


parasitoid wasp (allomone)



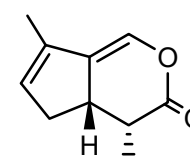
parasitoid wasp
(allomone)

plagiolactone



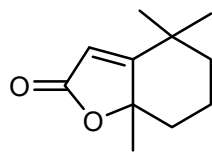
leaf beetle
(allomone)

epiplagiolactone



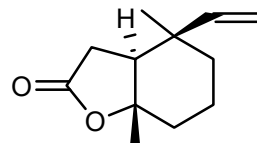
leaf beetle
(allomone)

C11 (C8 ring)
dihydroactinidioliden



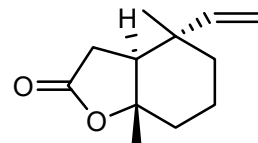
butterfly (M sex phe.)

C12 (C8 ring)
anastrephin



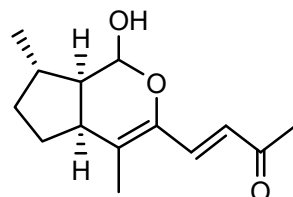
fruit fly (M sex phe.)

epi-anastrephin



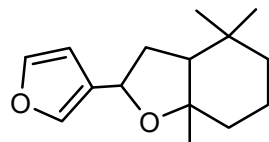
fruit fly (M sex phe.)

C14 (C8 ring)
gyrinidone



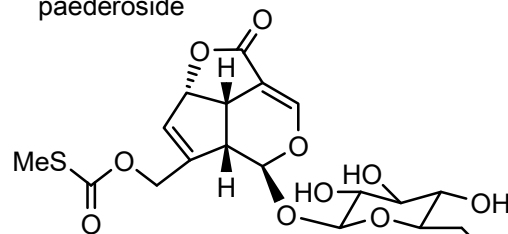
water beetle (allomone)

C15 (C8 ring)
ancistrofuran



termite (allomone)

C10 (C9 ring)
paederoside

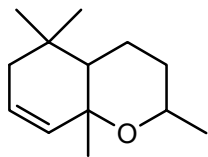


aphid (allomone)

[A-4] Terpene: Fused-ring comp. (iv)

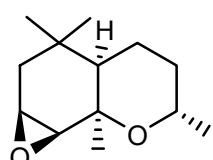
C13 (C9 ring)

dihydroedulan

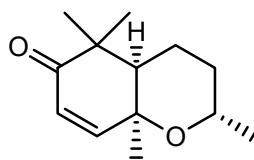


butterfly (M sex phe. ?)

epoxytetrahydroedulan

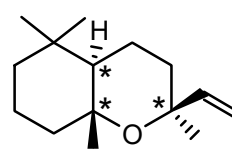


butterfly (M sex phe.)



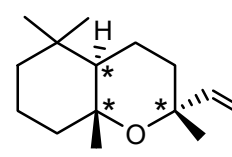
C15 (C9 ring)

cararrapi oxide



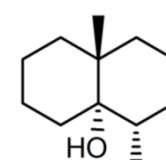
termite (allomone)

epi-cararrapi oxide



C12 (C10 ring)

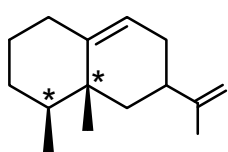
geosmin



millipede (alarm phe.)

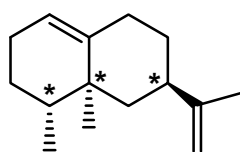
C15 (C10 ring)

aristolochene



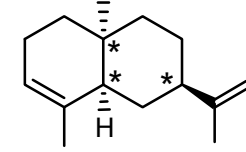
termite (allomone)

valencene



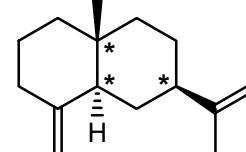
termite (gland secretion)

epi- α -selinene

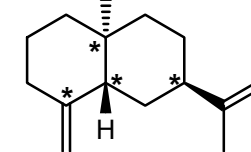


termite (allomone)

β -selinene

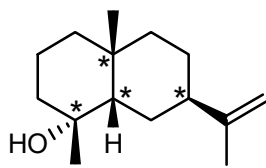


butterfly (larva allomone ?)
termite (aggregation phe.)



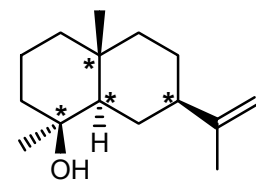
termite (gland secretion)

amiteol

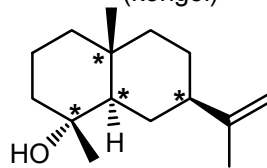


termite (allomone)

neo-intermedeol

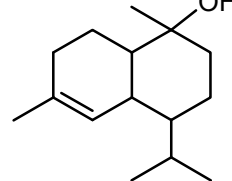


selin-11-en-4 α -ol (kongol)



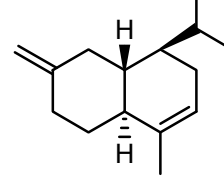
butterfly (larva allomone ?)

torreyol (δ -cadinol)



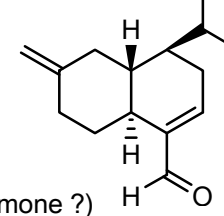
butterfly (M sex phe.)

γ 1-cadinene

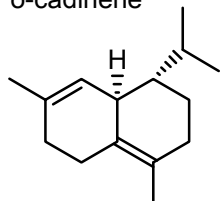


termite (allomone ?)

γ 1-cadinenal

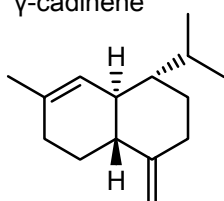


δ -cadinene



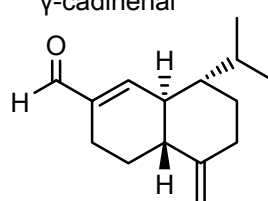
butterfly (larva allomone ?, M gland secretion)

γ -cadinene



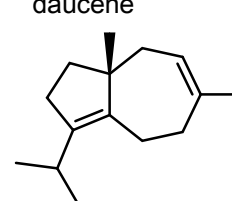
termite (primer phe., allomone), leaf beetle (M sex phe. ?)

γ -cadinenal

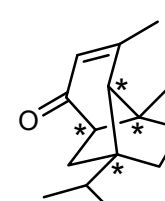


termite (primer phe., allomone)

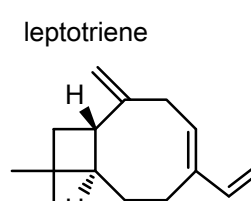
daucene



darkling beetle (M aggregation phe.)



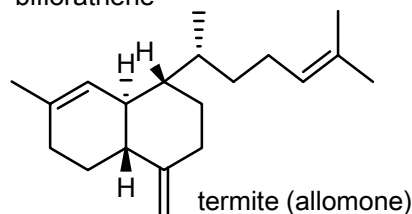
stink bug (M sex phe.)



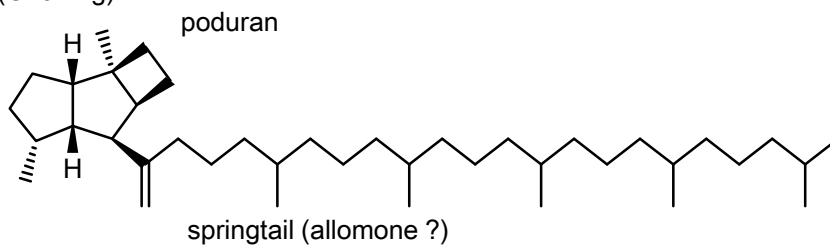
true bug (M aggregation phe.)

[A-4] Terpene: Fused-ring comp. (v)

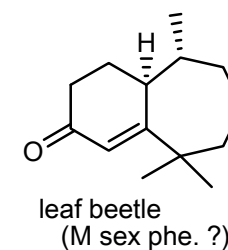
C20 (C10 ring)
bifloratriene



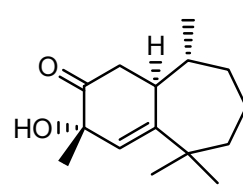
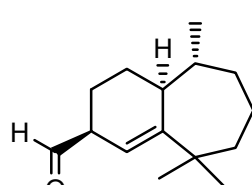
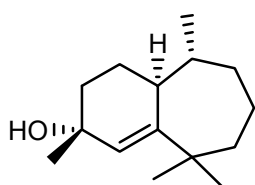
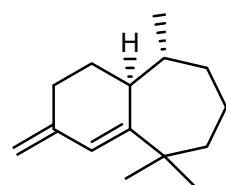
C40 (C10 ring)



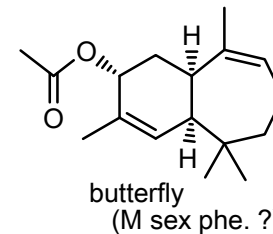
C14 (C11 ring)



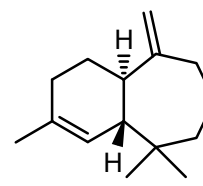
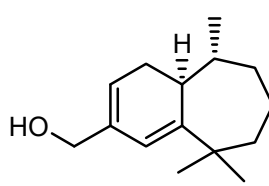
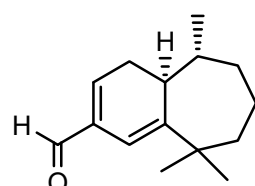
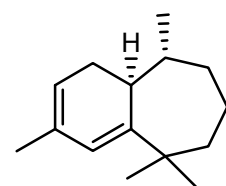
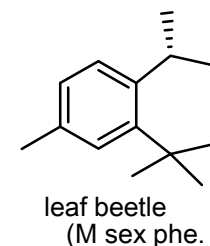
C15 (C11 ring)



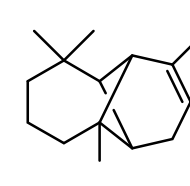
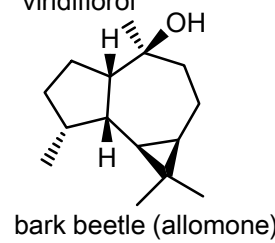
γ -himachalene



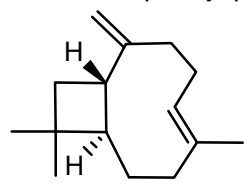
ar-himachalene



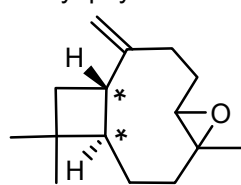
viridiflorol



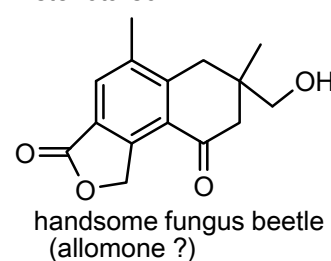
β -caryophyllene



caryophyllene oxide

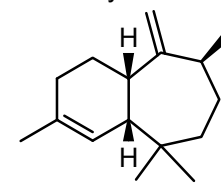


stenotarsol



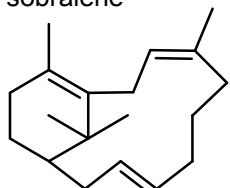
C16 (C11 ring)

3-methyl- α -himachalene



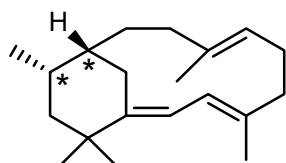
[A-4] Terpene: Fused-ring comp. (vi)

C20 (C15)
sobralene



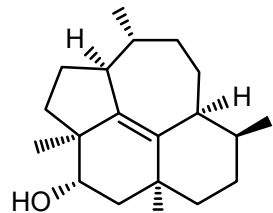
sand fly
(M sex phe.)

cubugene



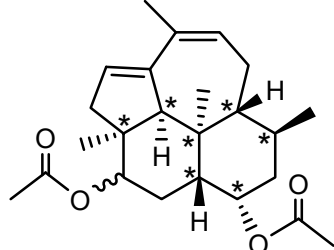
termite (allomone)

C20 (C16 ring)
rippertane deriv.



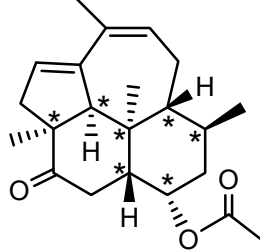
termite (allomone)

kempene 1

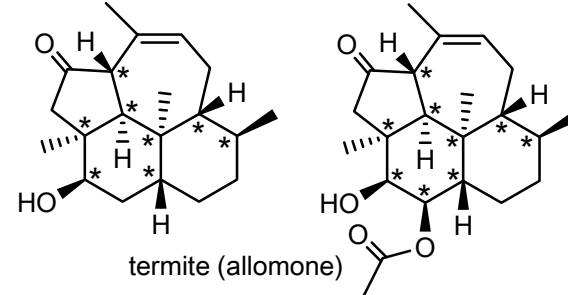


termite (allomone)

kempene 2

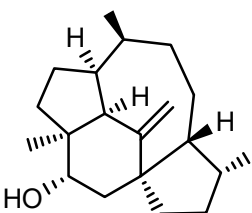


kempenone deriv.



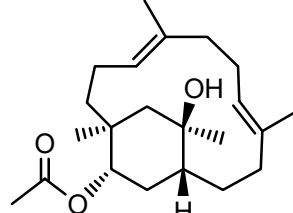
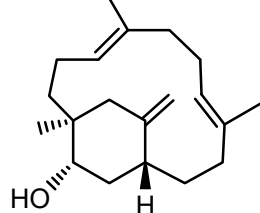
termite (allomone)

longipenol

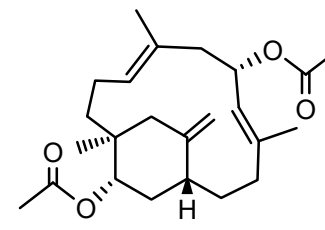
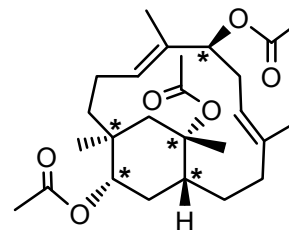


termite (allomone)

secotrinerivitane



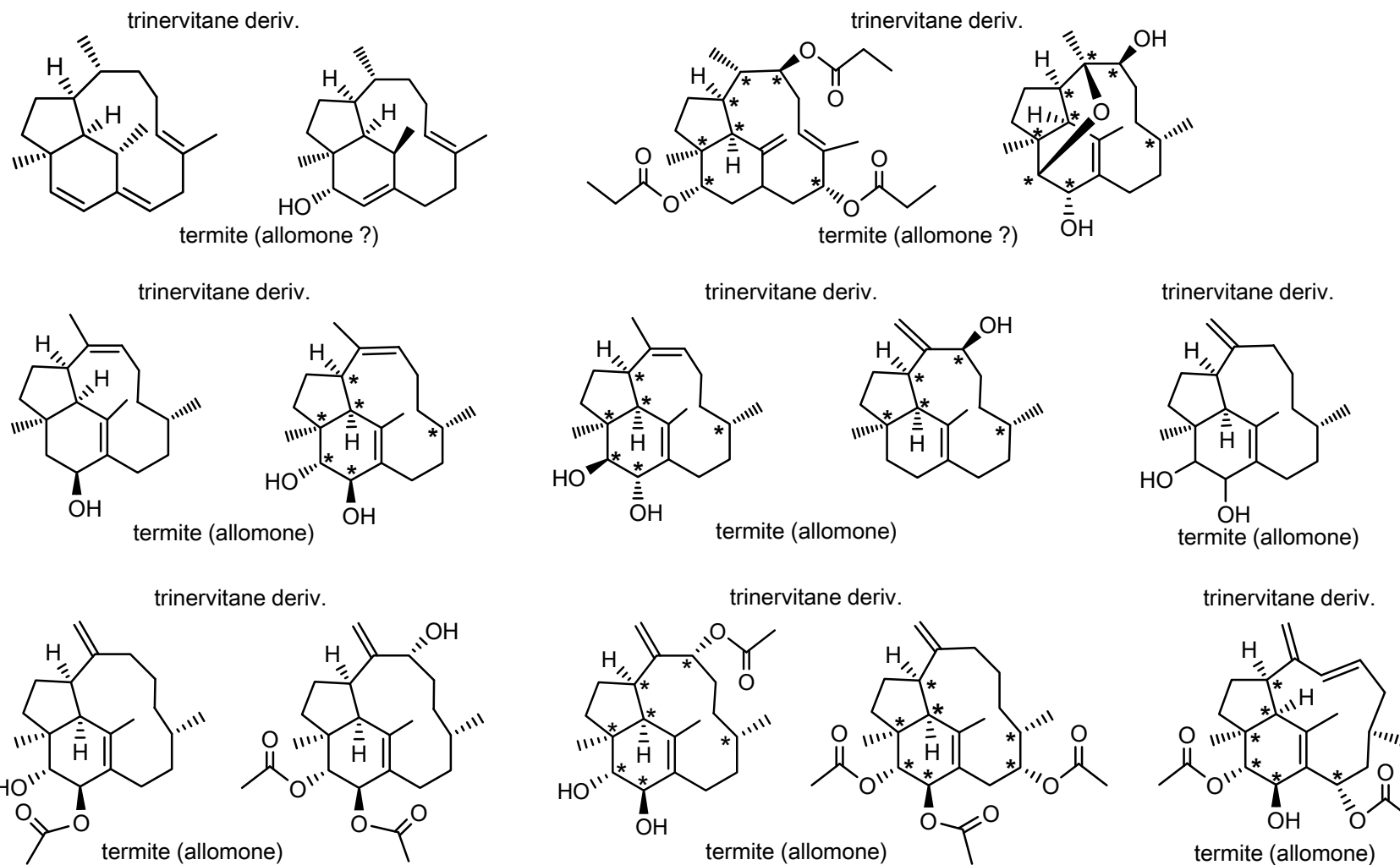
termite (allomone)



termite (allomone ?)

[A-4] Terpene: Fused-ring comp. (vii)

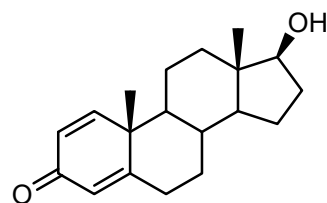
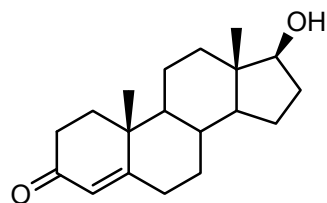
C20 (C16 ring)



[A-4] Terpene: Fused-ring comp. (viii)

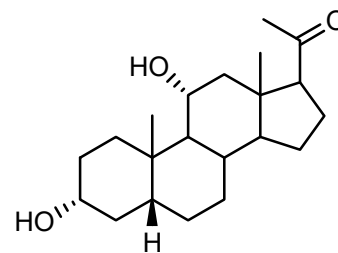
C19 (C17 ring)

testosterone

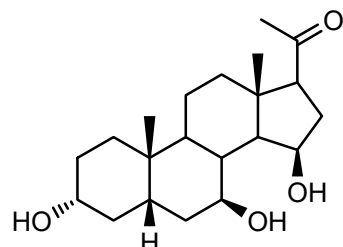
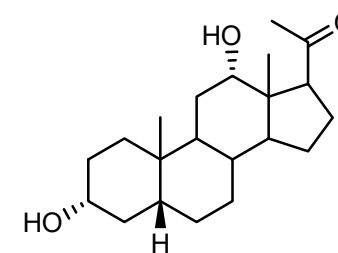


water beetle (allomone ?)

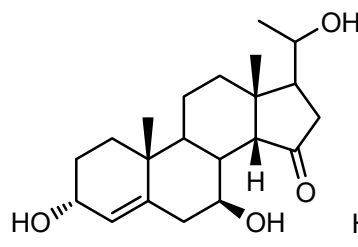
C21 (C17 ring)



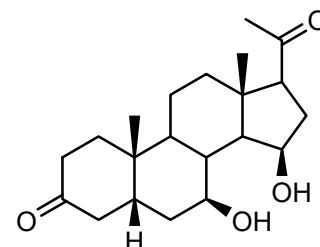
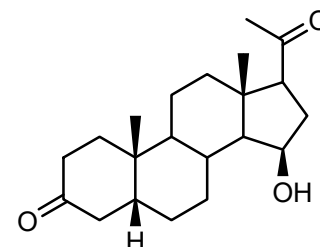
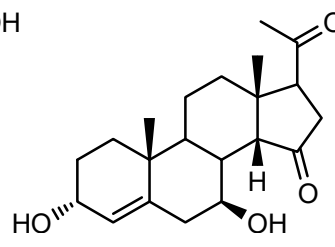
water beetle (allomone)



burying beetle (allomone)

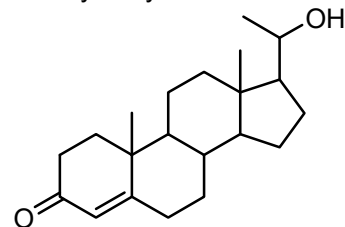


burying beetle (allomone)

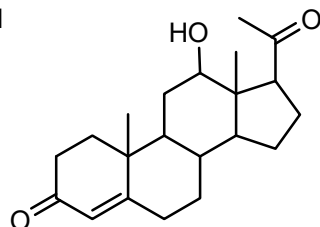


burying beetle (allomone)

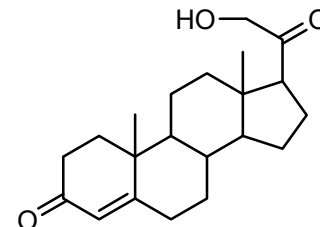
6-dihydrocysterone



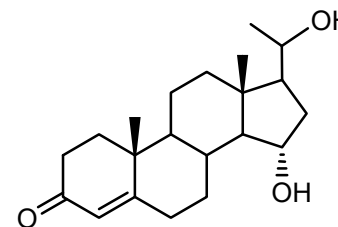
water beetle (allomone)



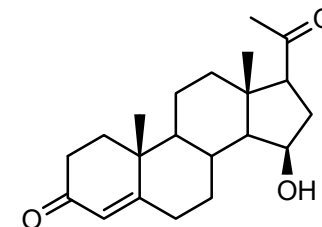
deoxycorticosterone, cortexone



water beetle, aquatic bug
(allomone)

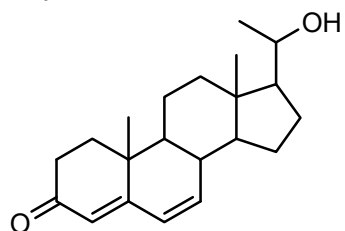


water beetle (allomone)



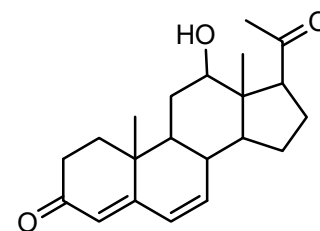
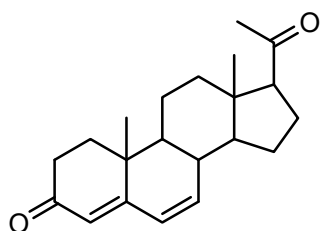
burying beetle (allomone)

cybisterone



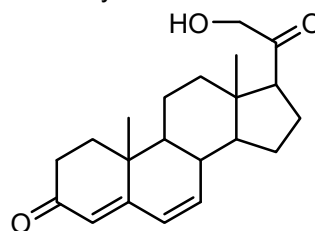
water beetle (allomone)

6-dehydroprogesterone

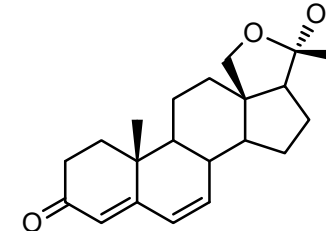


water beetle (allomone)

6-dehydrocortexone



mirasorvone

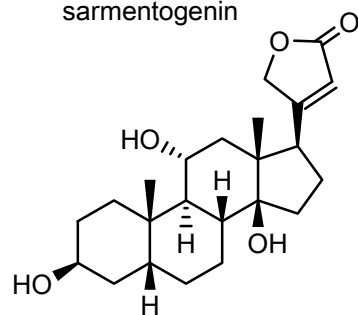


water beetle (allomone)

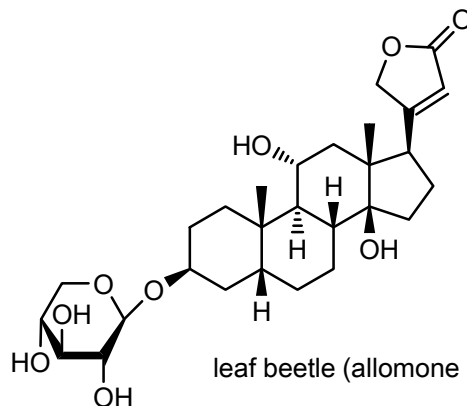
[A-4] Terpene: Fused-ring comp. (ix)

C23 (C17 ring)

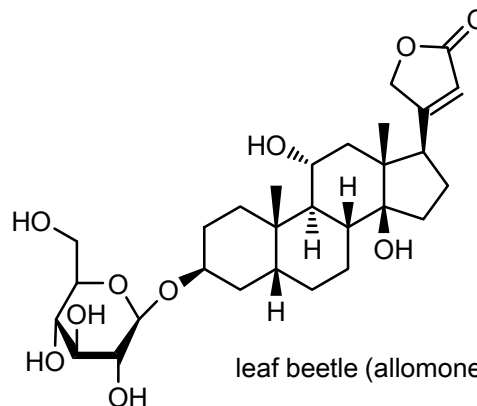
sarmentogenin



leaf beetle (allomone ?)

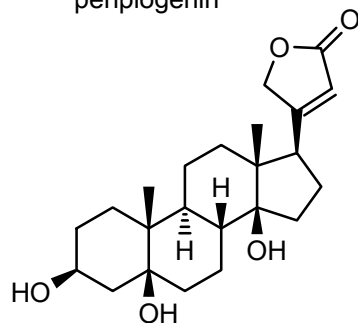


leaf beetle (allomone ?)

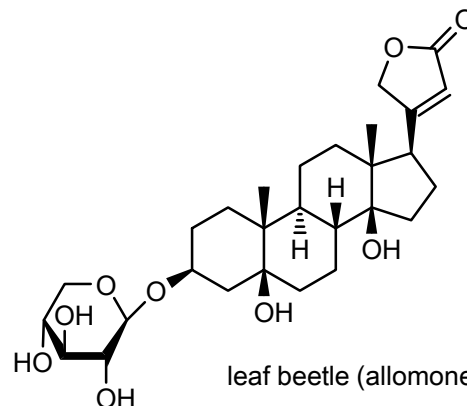


leaf beetle (allomone ?)

periplogenin

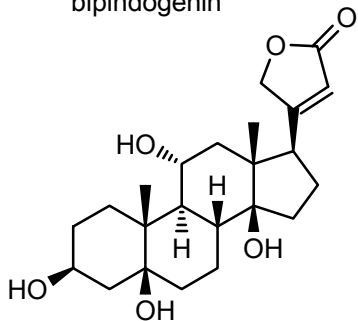


leaf beetle (allomone ?)

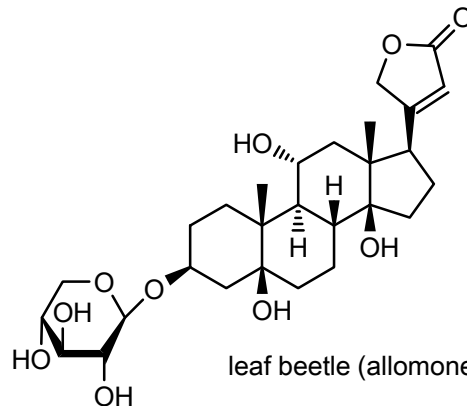


leaf beetle (allomone ?)

bipindogenin



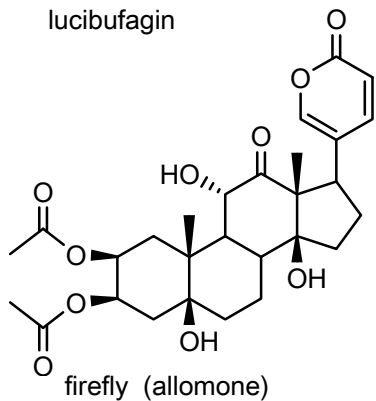
leaf beetle (allomone ?)



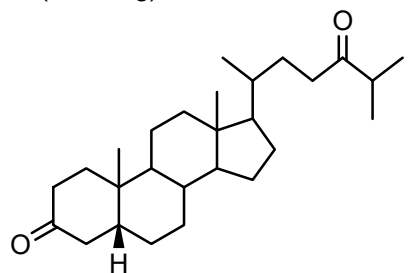
leaf beetle (allomone ?)

[A-4] Terpene: Fused-ring comp. (x)

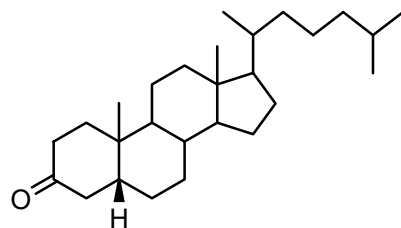
C24 (C17 ring)
lucibufagin



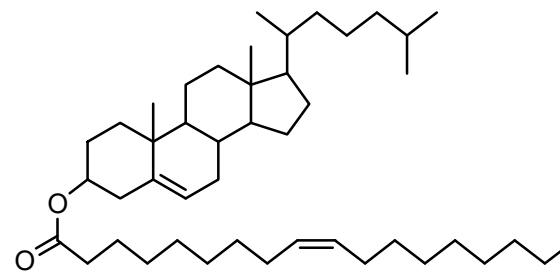
C27 (C17 ring)



lappet moth (larva trail phe.)

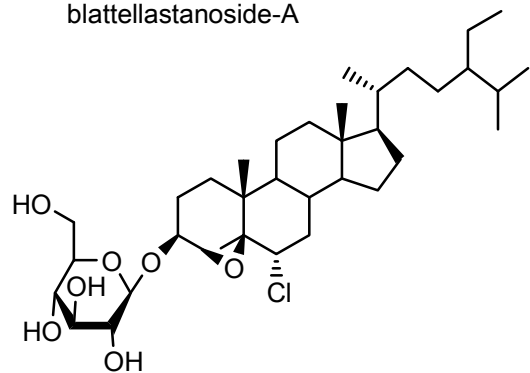


cholesteryl oleate



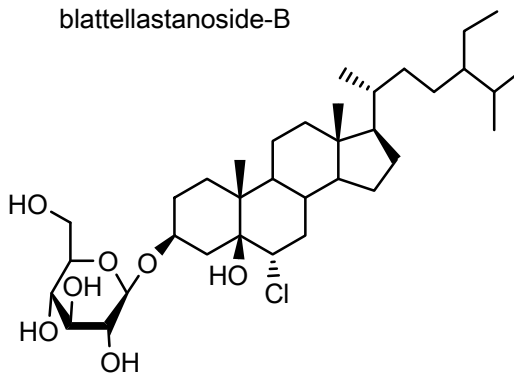
tick (F sex phe.)

C29 (C17 ring)
blattellastanoside-A



cockroach (aggregation phe.)

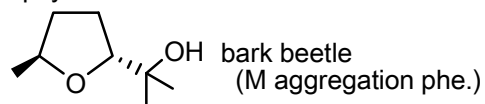
blattellastanoside-B



[A-5] Terpene: Heterocyclic comp. (i)

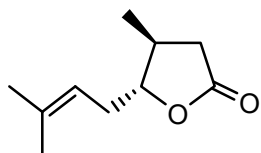
C8 (C4 ring)

pityol

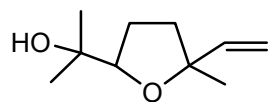


C10 (C4 ring)

eldanolide

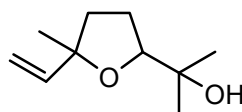


pyralid moth
(M sex phe.)



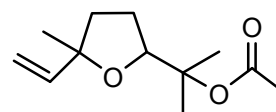
butterfly (M sex phe.)

linalool oxide

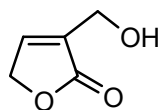


butterfly (M sex phe. ?)

linalool oxide acetate

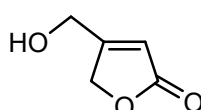


isosiphonodin



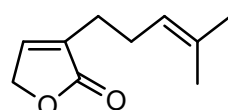
ermine moth
(larva allomone ?)

siphonodin

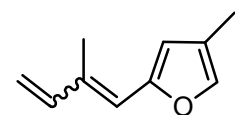
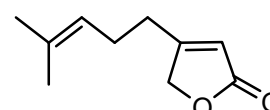


acarid mite, ant
(gland secretion)

α,α -acariolide

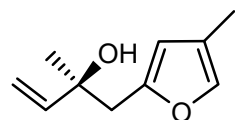


α,β -acariolide

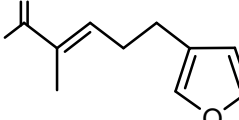


butterfly (M sex phe. ?)

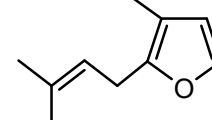
elymniafuran



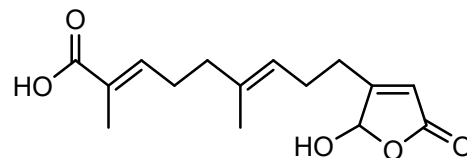
E-perillenal



rosefuran

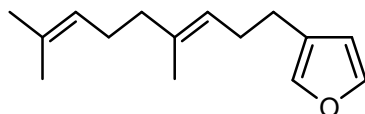


dolichovespulid



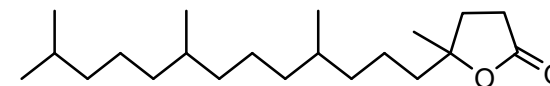
C15 (C4 ring)

dendrolasin



wasp (queen phe.)

C21 (C4 ring)

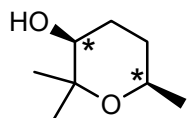


butterfly (sex phe. ?)

ant (alarm phe.)

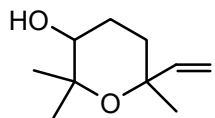
[A-5] Terpene: Heterocyclic comp. (ii)

C8 (C5 ring)
cis-vittatol

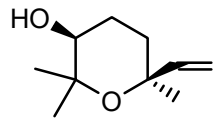


bark beetle
(M aggregation phe.)

C10 (C5 ring)

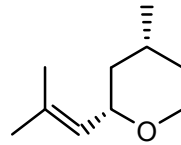


butterfly
(M sex phe.)

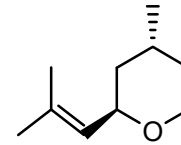


pyralid moth
(M sex phe.)

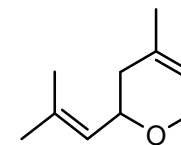
rose oxide



longhorn beetle (allomone)
assassin bug (F sex ?)

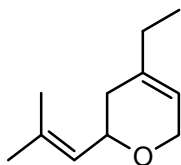


nerol oxide



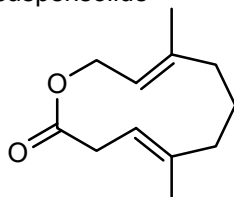
ant-lion (M sex phe. ?)

C11 (C5 ring)
10-homonerol oxide



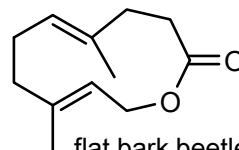
ant-lion (M sex phe. ?)

C12 (C10 ring)
suspensolide



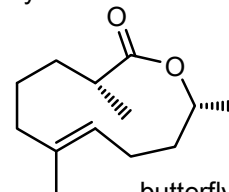
frute fly (M sex phe.)

cucujolide I,
ferrulactone



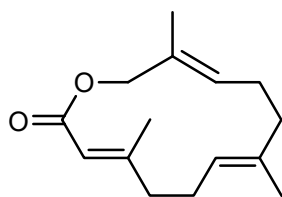
flat bark beetle
(aggregation phe.)
butterfly (M sex phe.)

C13 (C10 ring)
phyllisolide



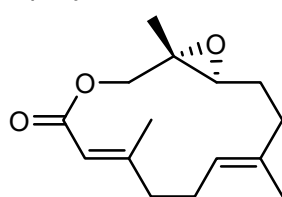
butterfly (M anti-
aphrodisiac phe.)

C15 (C12 ring)
niaviolide

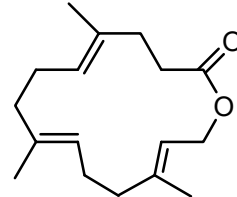


butterfly (M sex phe.)

epoxyniaviolide



C17 (C14 ring)
brassicalactone



butterfly (M sex phe.)