

# 4



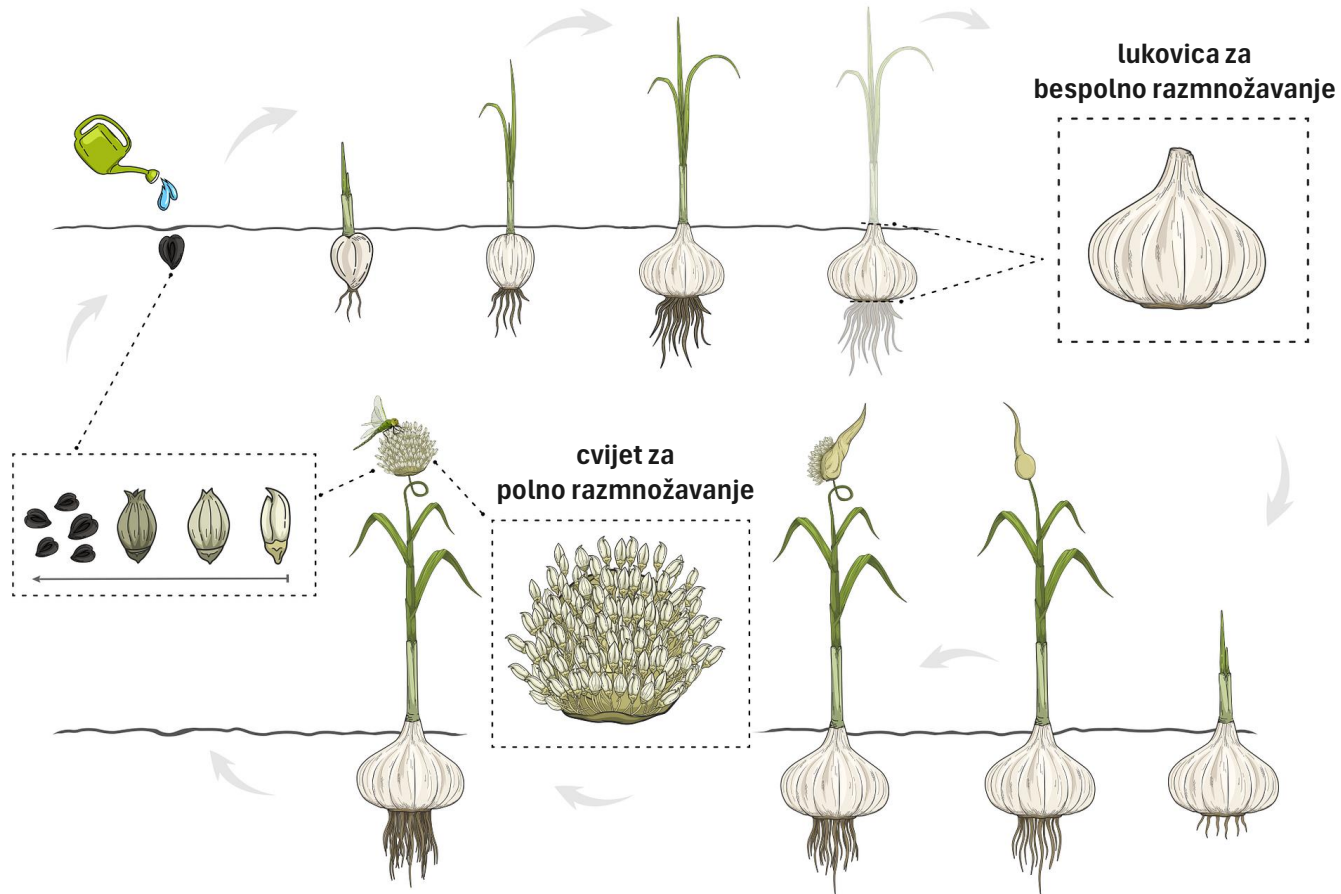
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**Razmnožavanje biljaka**  
**Smjena generacija**  
**Cvijet**  
**Oprašivanje i oplodjenje**  
**Životni ciklus cvjetnica**  
**Cvasti**

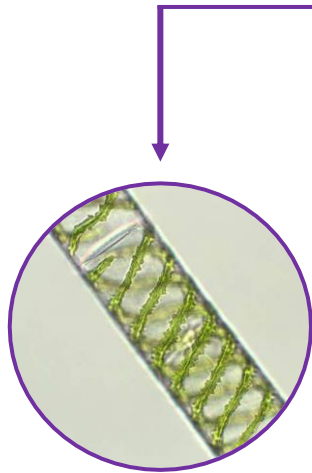
# Razmnožavanje biljaka



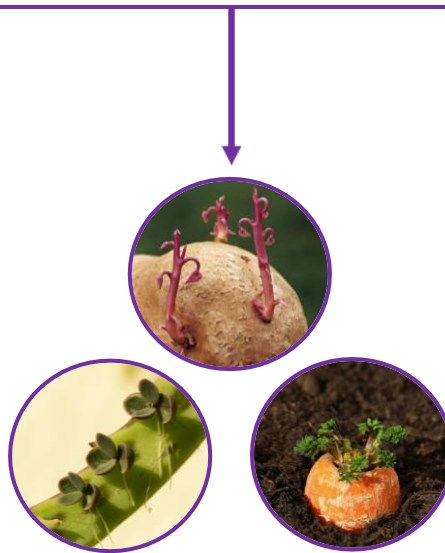
# Polno i bespolno razmnožavanje



# Bespolno razmnožavanje



fragmentacijom

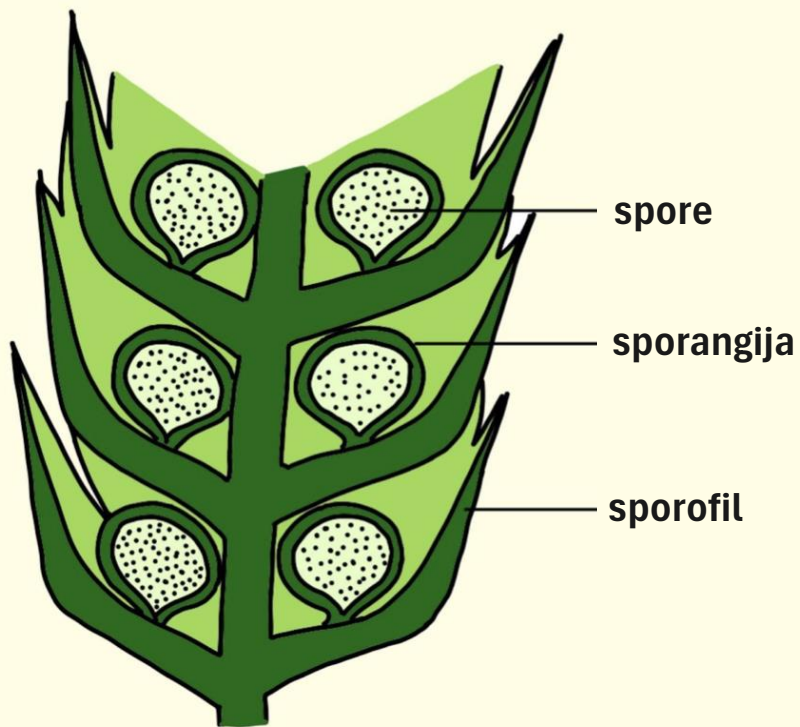


vegetativno

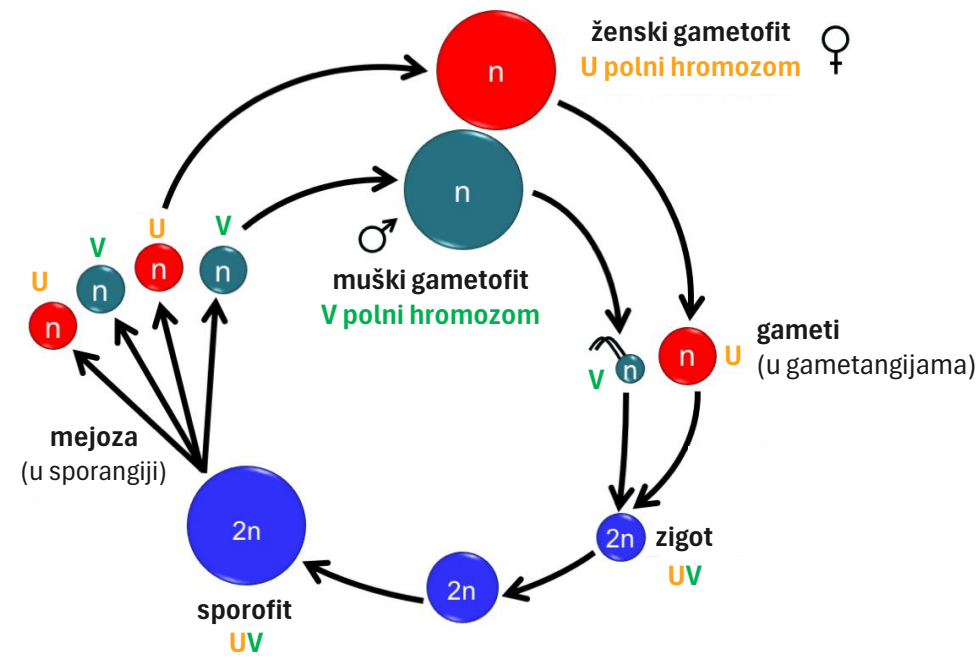
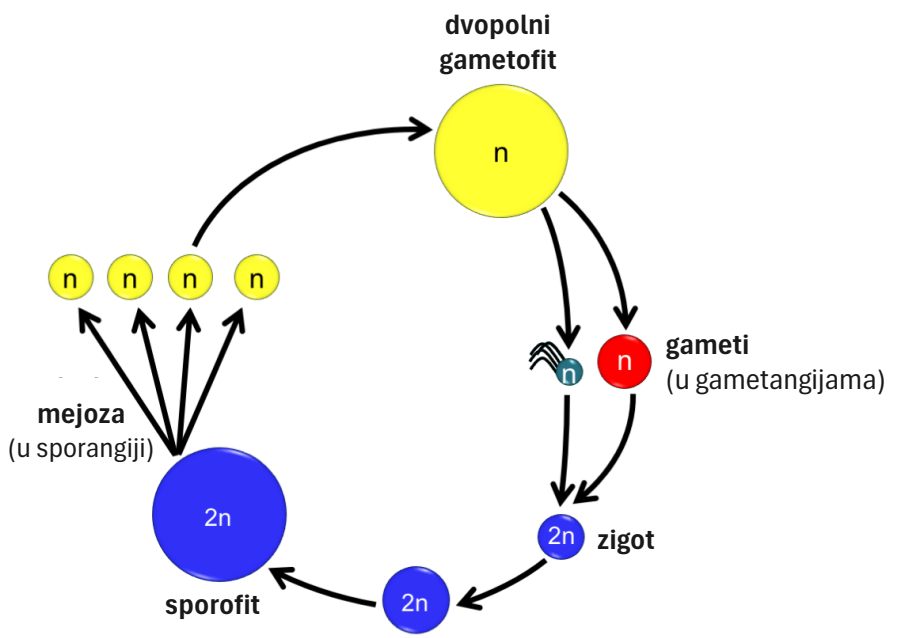


sporama

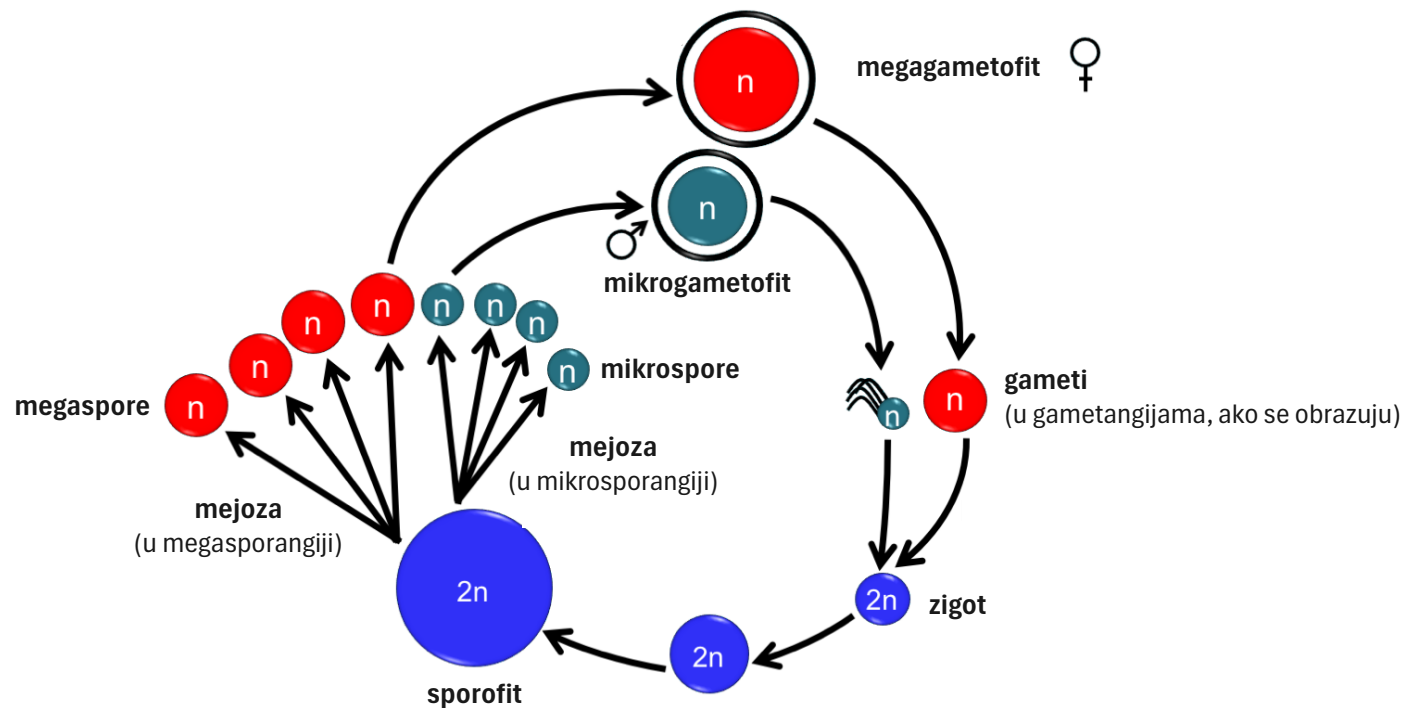
# Sporogeneza je proces stvaranja spora



# Izospornost



# Heterospornost

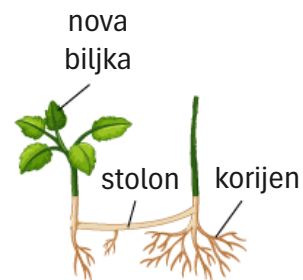
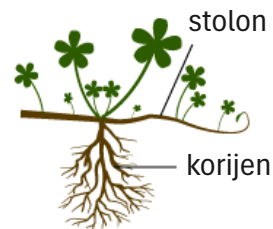
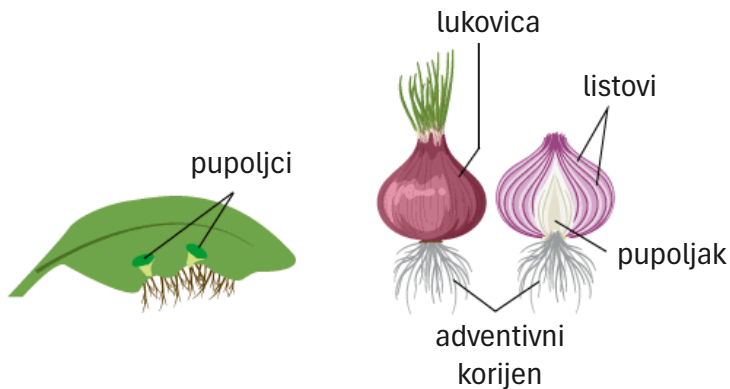
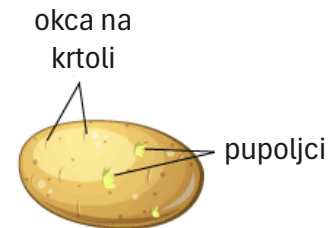
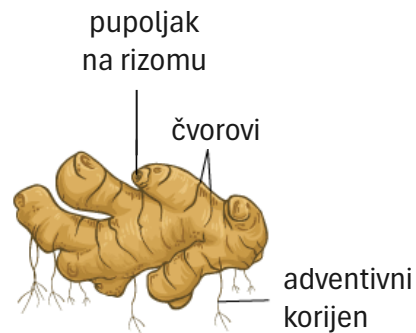
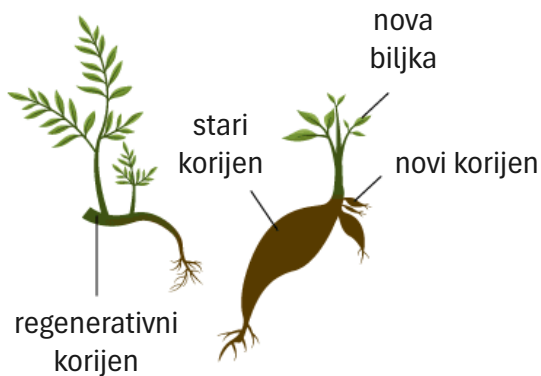


# Vegetativno razmnožavanje





# Razmnožavanje djelovima tijela





# Primjeri vegetativnog razmnožavanja





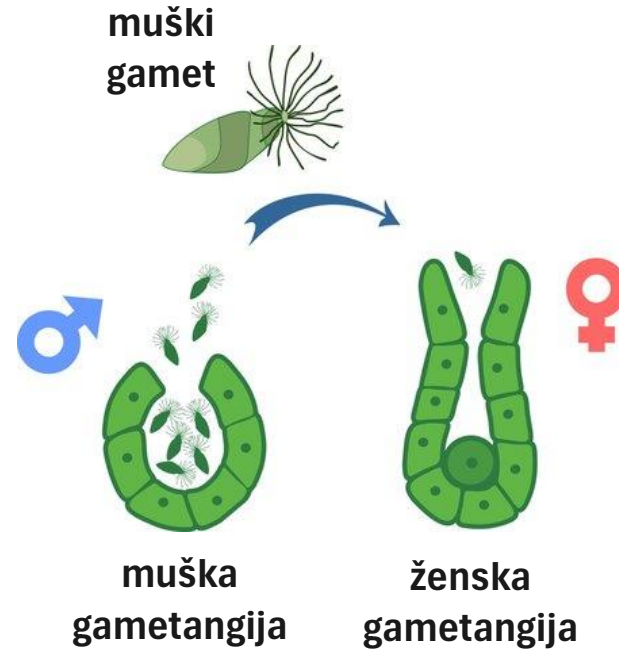
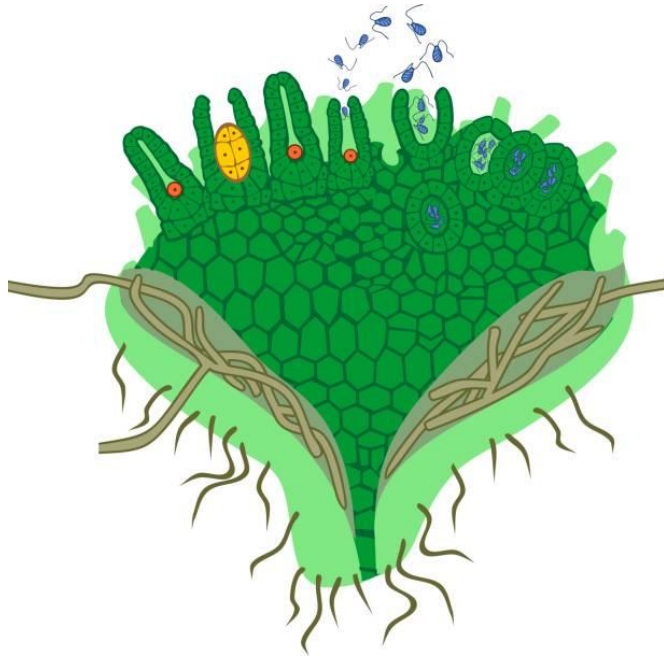
# Rasplodni bulbili



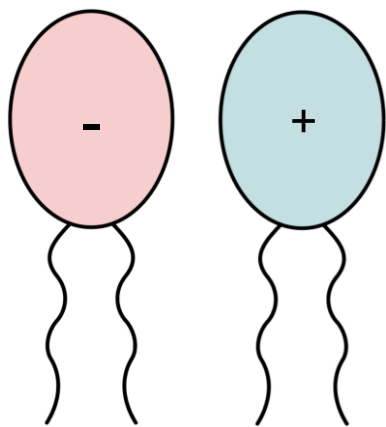
# Polno razmnožavanje

A close-up photograph of liverwort leaves, showing a prominent hexagonal cellular pattern on their surface. The leaves are bright green and have a slightly wavy, scalloped edge. They are growing on a dark, moist substrate, likely soil or a rock surface, surrounded by other mosses and ferns. The lighting is soft, highlighting the texture of the leaves.

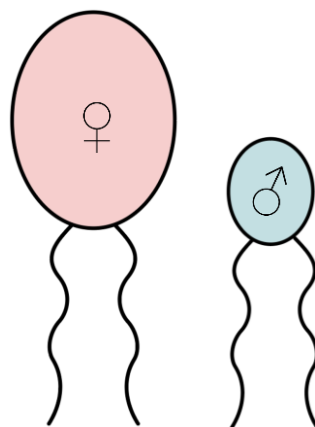
# Gametogeneza je proces stvaranja gameta



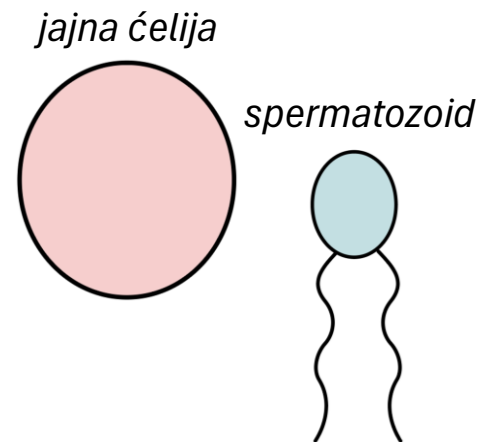
# Tipovi gameta i polnog procesa



izogamija

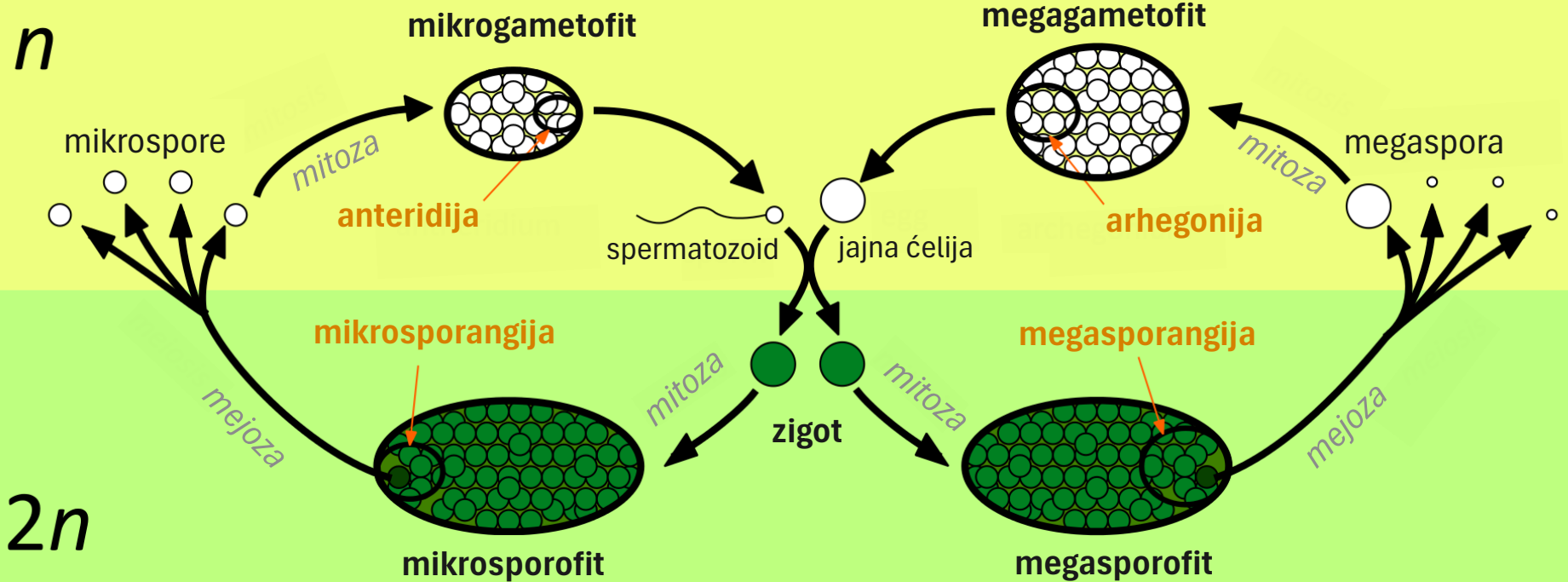


anizogamija



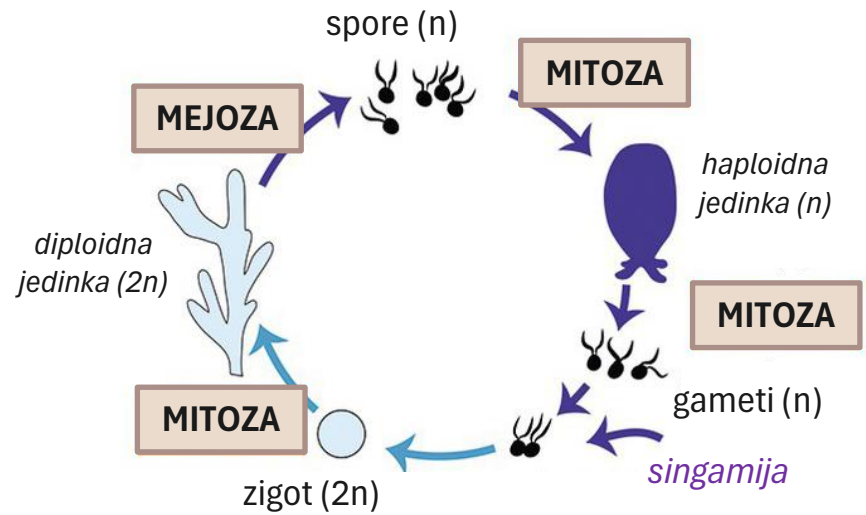
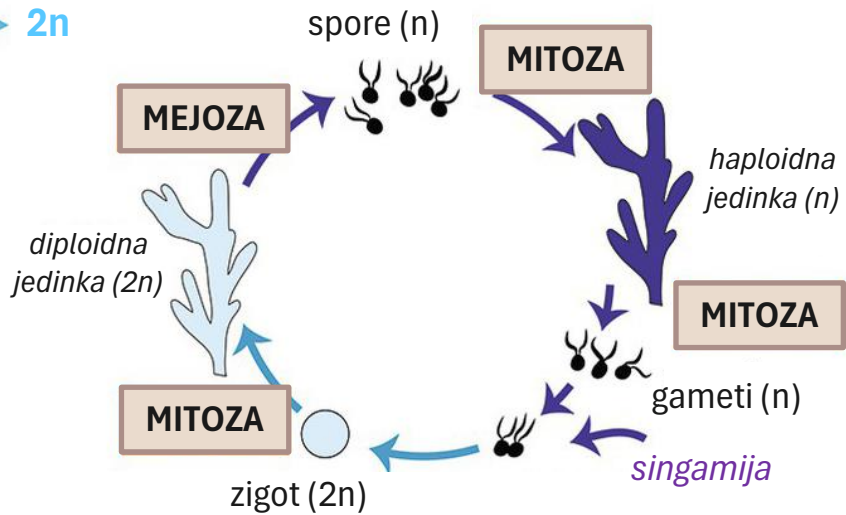
oogamija

# Smjena generacija



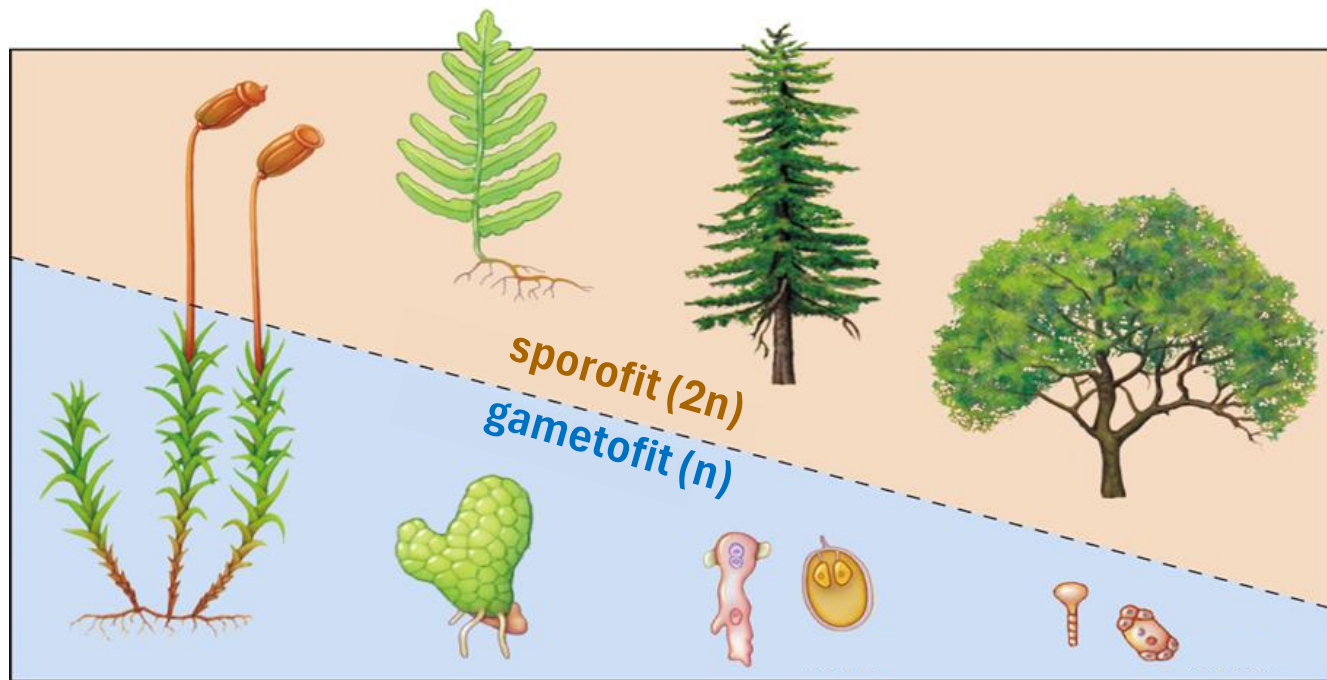
# Izomorfne i heteromorfne generacije

➡  $n$   
➡  $2n$





# Prelazak na dominaciju sporofita



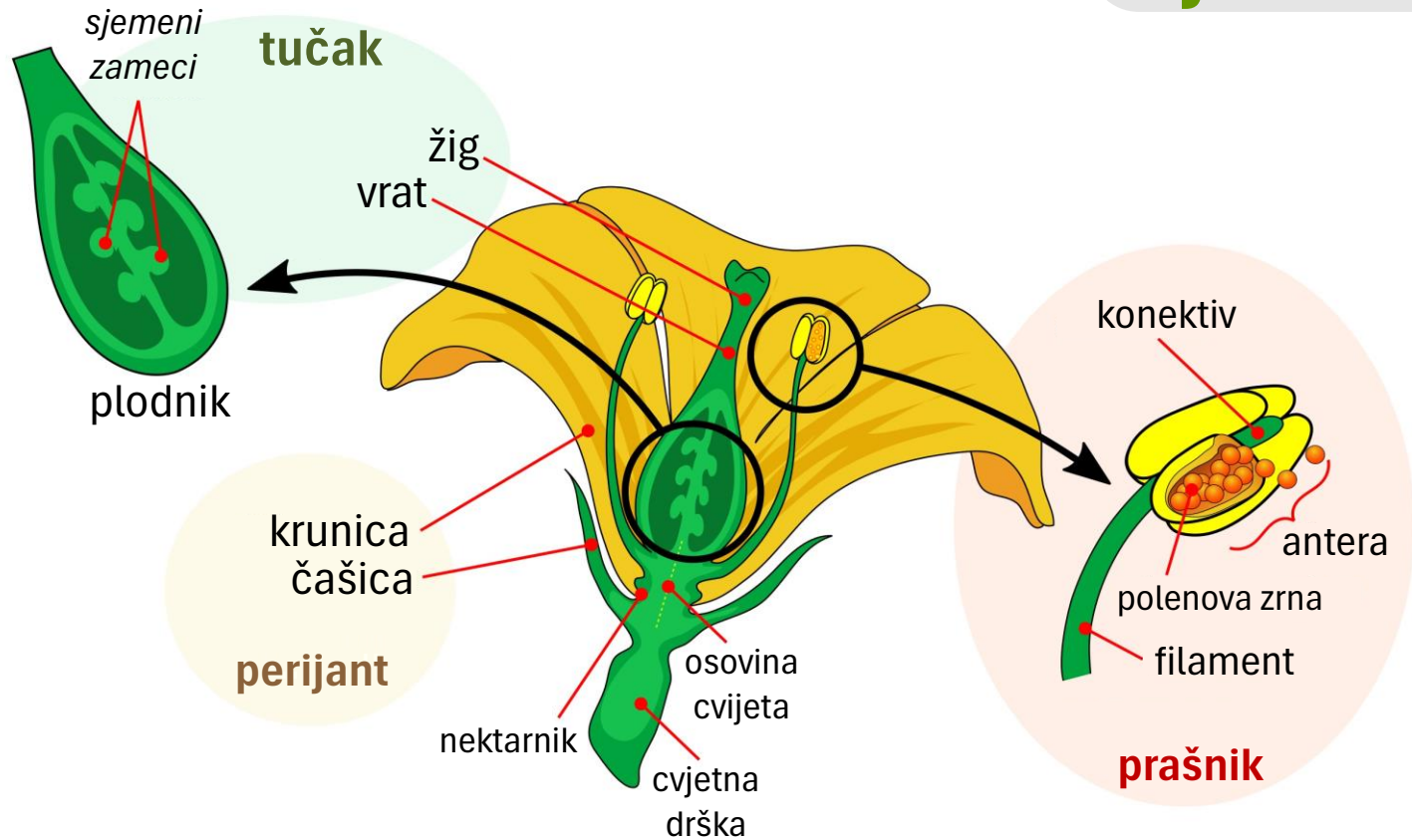
# Flos



# Šta je brakteja?



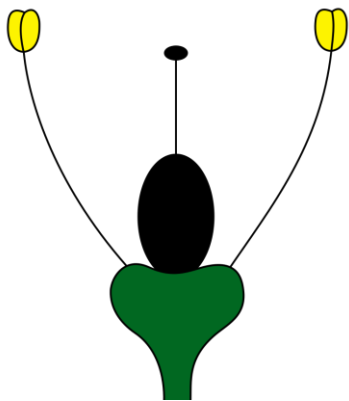
# Djelovi cvijeta



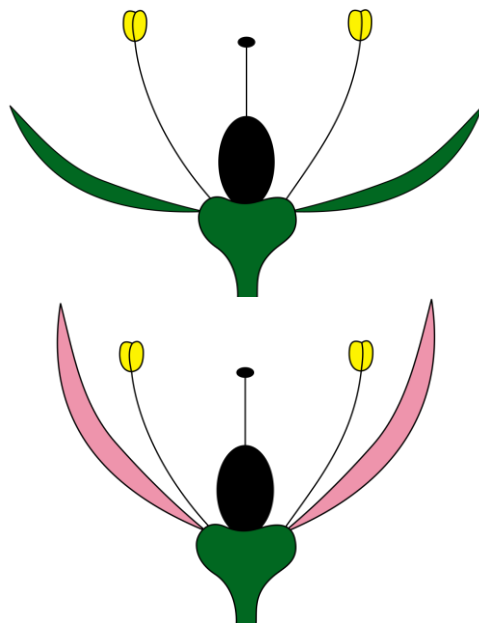
# Cvjetna drška



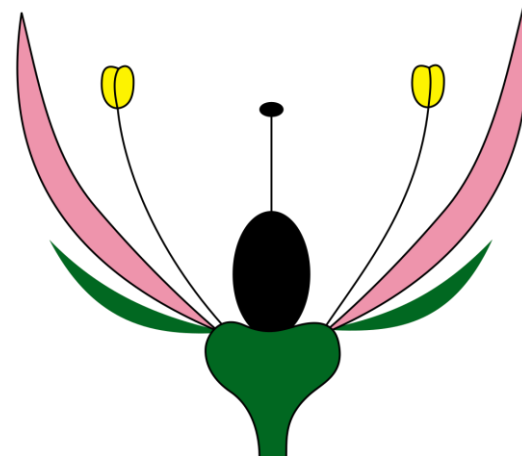
# Cvjetni omotač: perijant



ahlamidan



homohlamidan



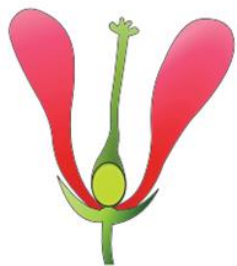
heterohlamidan



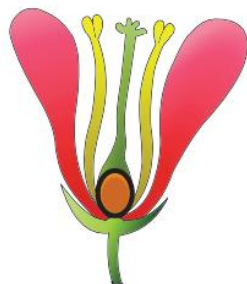
## Složenost perijanta



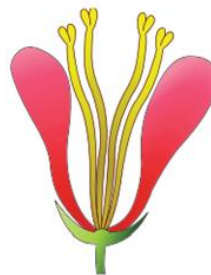
# Jednopolni i dvopolni cvjetovi



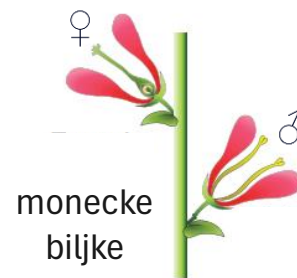
ženski  
cvijet



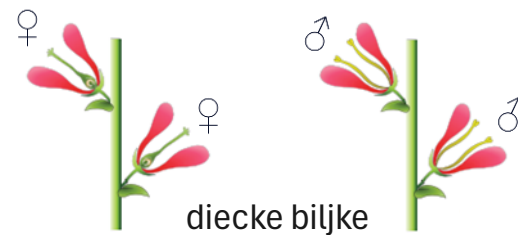
dvopolni  
cvijet



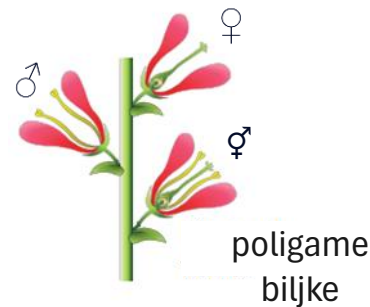
muški  
cvijet



monecke  
biljke



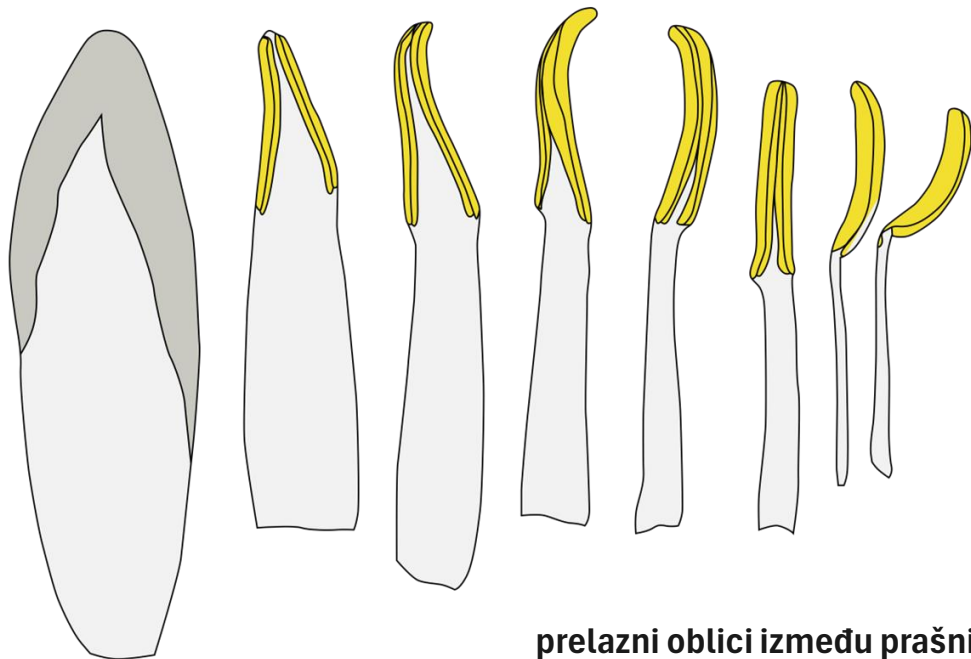
diecke biljke



poligame  
biljke



# Svi cvjetni djelovi su nastali od trofosporofila



prelazni oblici između prašnika  
i latica u cvijetu lokvanja



# Calyx/sepalum





# Usložnjavanje i redukcija čašice



# Corolla/petalum

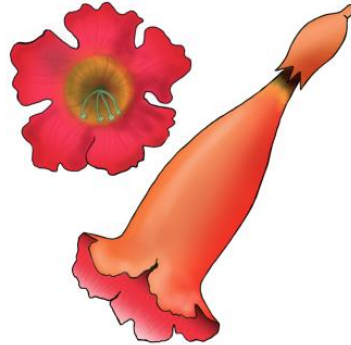
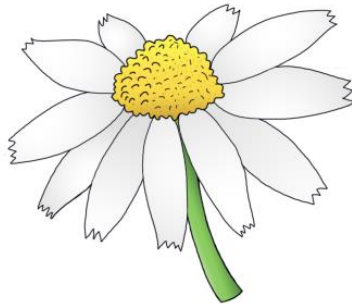
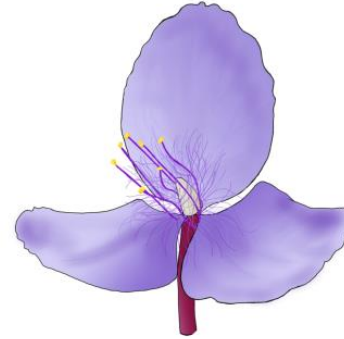
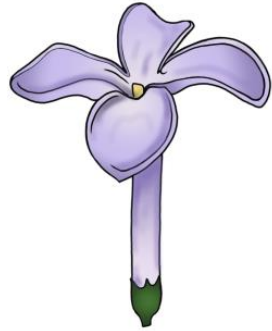




## Usložnjavanje krunice



# Oblik cvijeta kao taksonomski karakter



# Simetrija cvijeta



**aktinomorfna**



**zigomorfna**



**asimetrični cvijet**



# Gamopetalija i gamosepalija







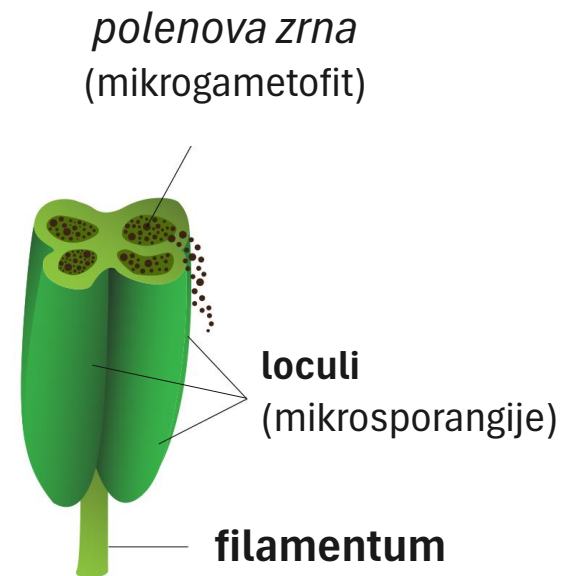
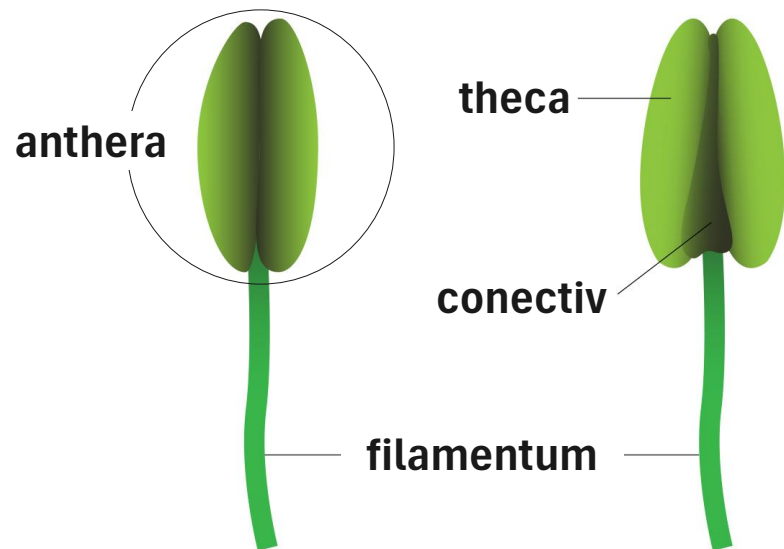
# Usložnjavanje cvijeta razrastanjem brakteja



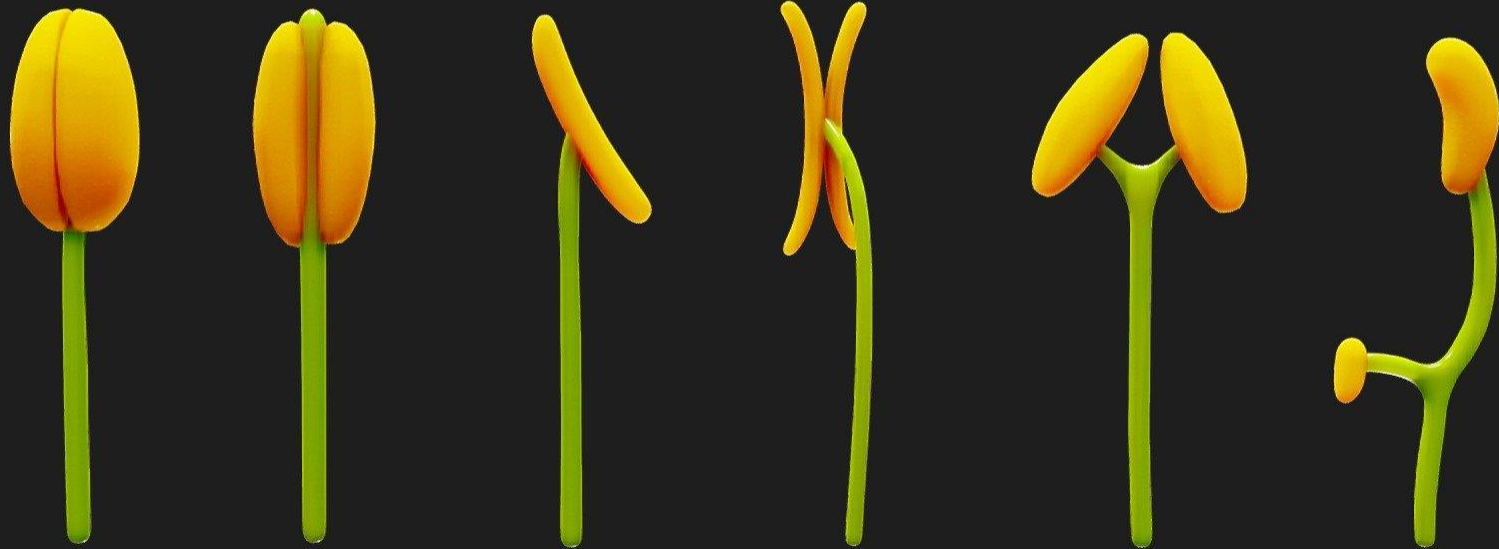
# Androeceum/stamen



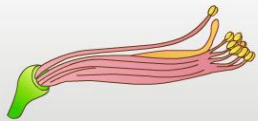
# Djelovi prašnika



# Forma antera je različita



# Broj i izgled prašnika kao sistematska karakteristika



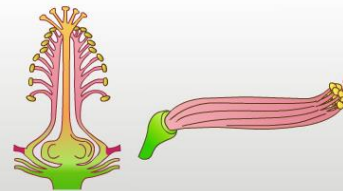
**didelfija**



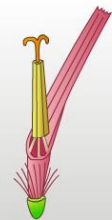
**didinamični**



**epipetalija**



**monodelfija**



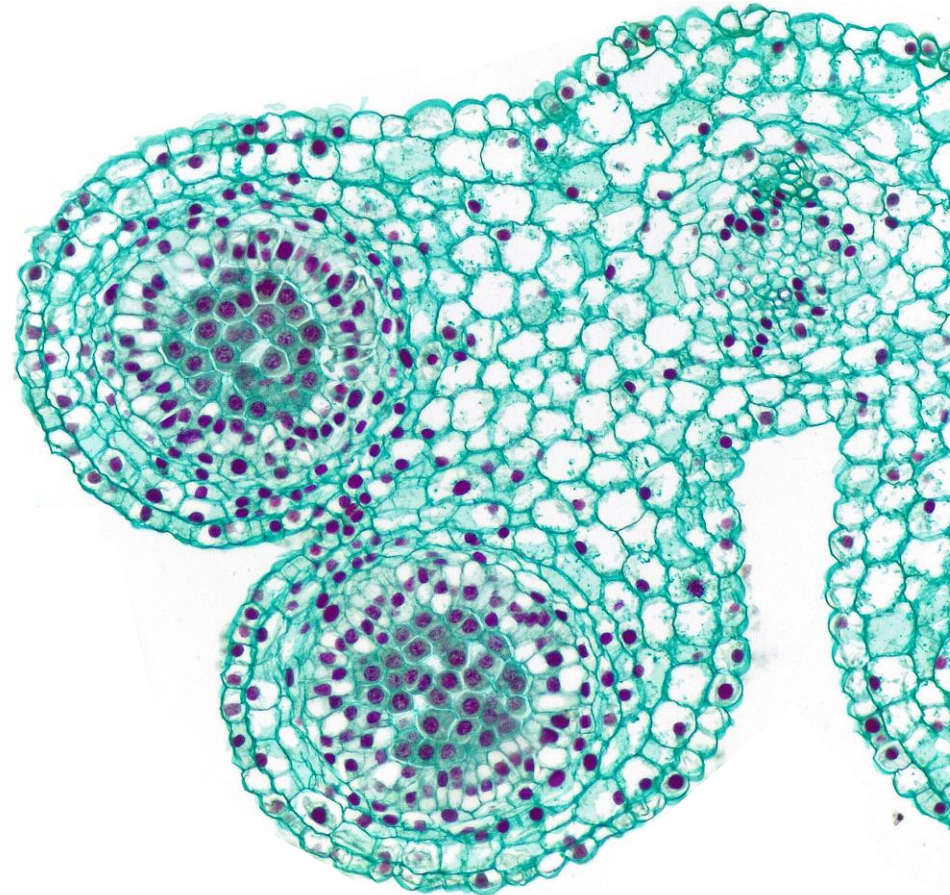
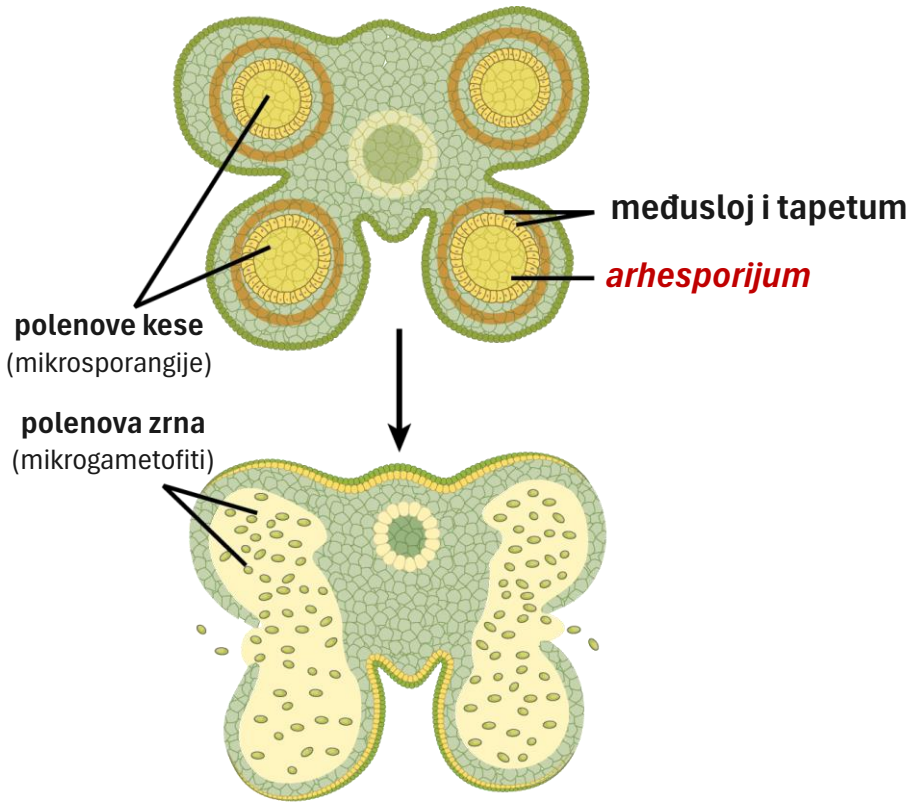
**srasle antere**



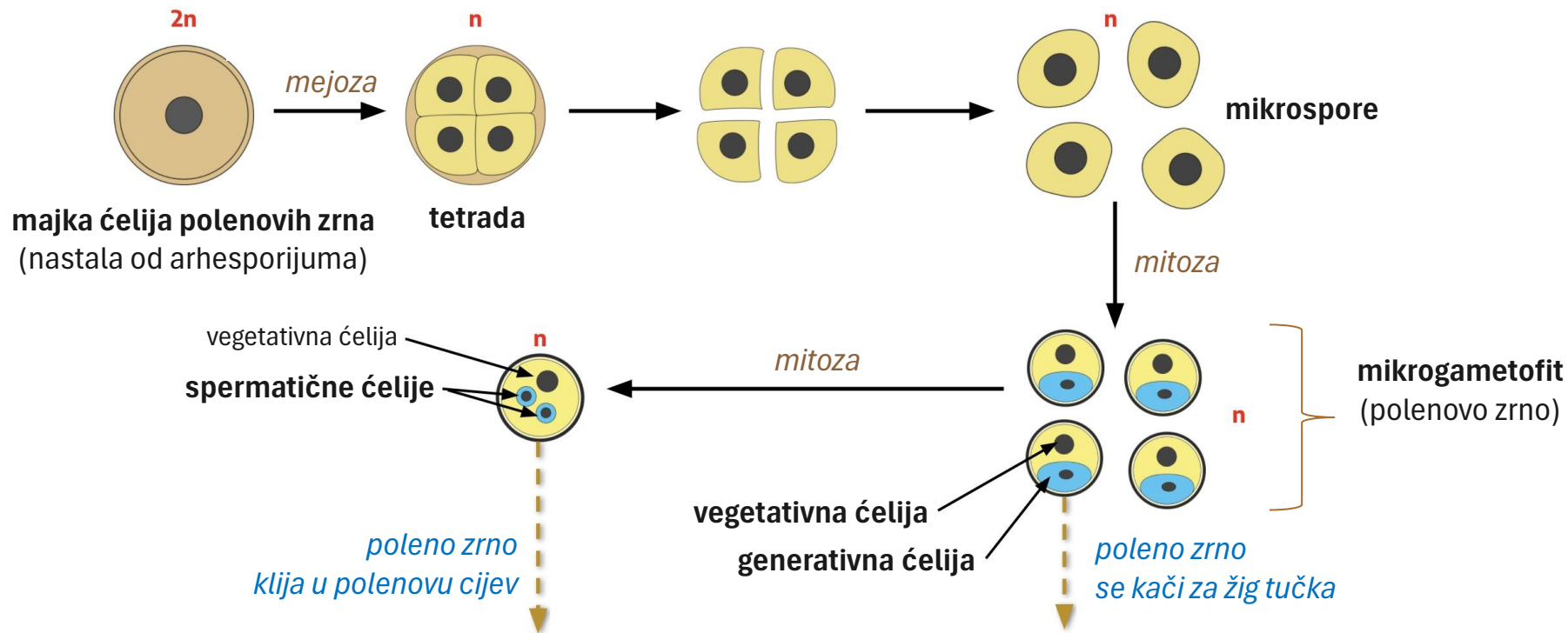
# Staminodije



# Polenova kesa

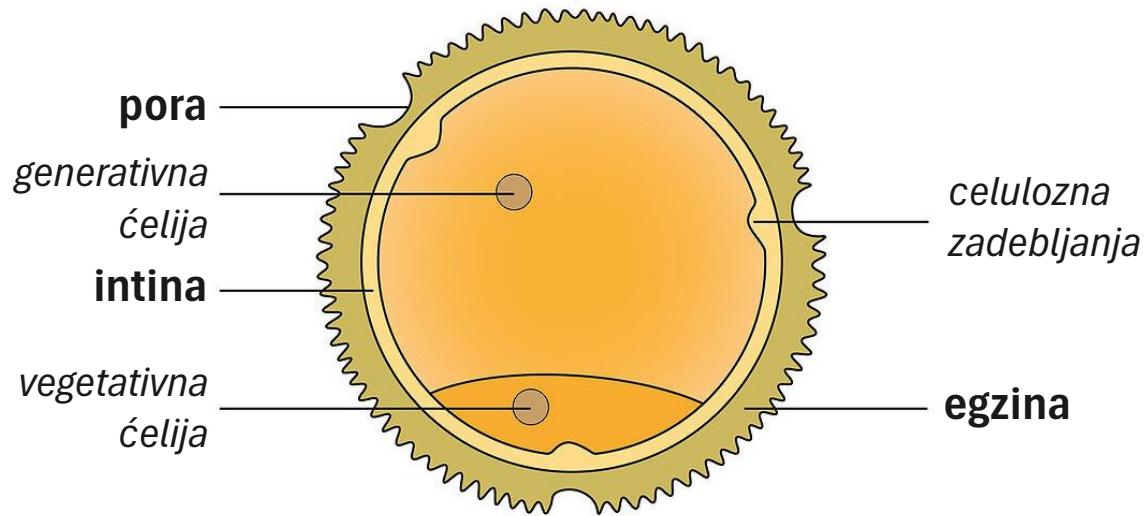


# Mikrosporogeneza i mikrogametogeneza

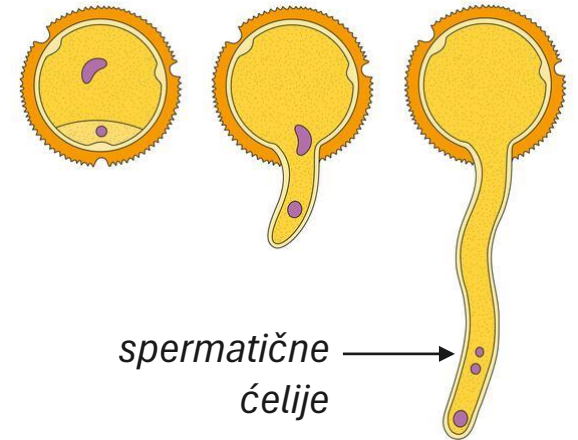




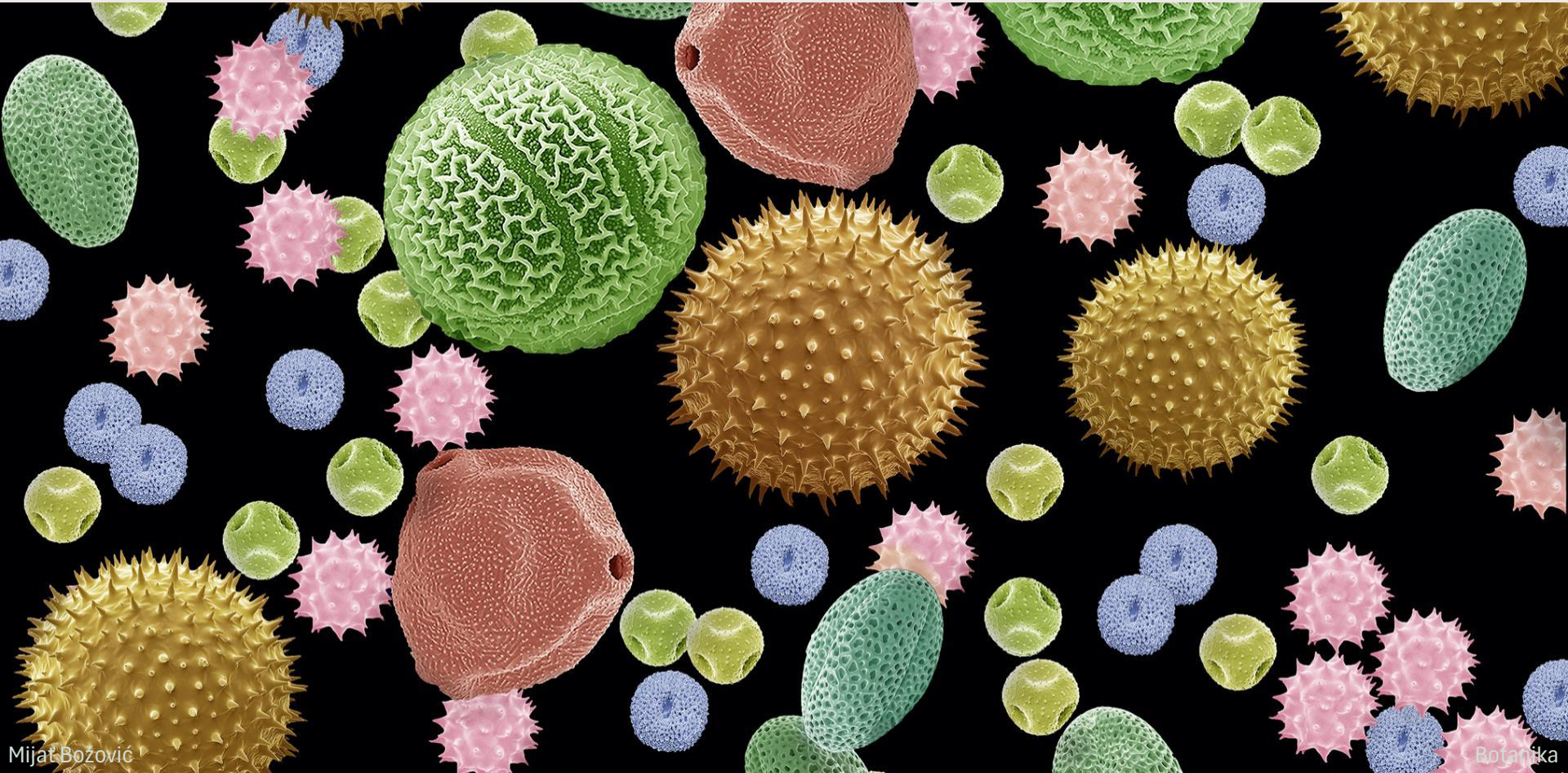
# Polenovo zrno



## klijanje polenovog zrna



# Oblik polenovih zrna



# Polinije orhideja



# Gynoeceum/carpellum



# Carpellum vs. pistillum



1 tučak, 1 karpela

*monokarpan  
gineceum*



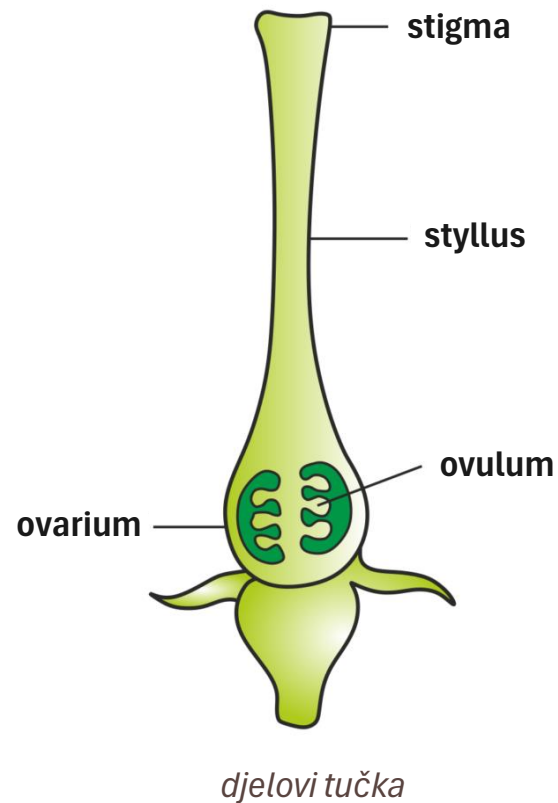
3 tučka, 3 karpela

*apokarpan  
gineceum*



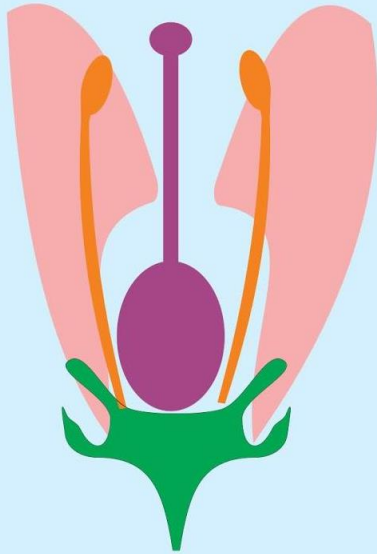
1 tučak, 3 karpela

*sinkarpan  
gineceum*



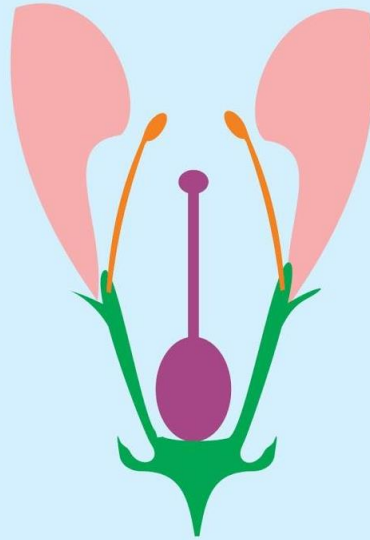
# Položaj plodnika u cvijetu

*hipogini cvijet*



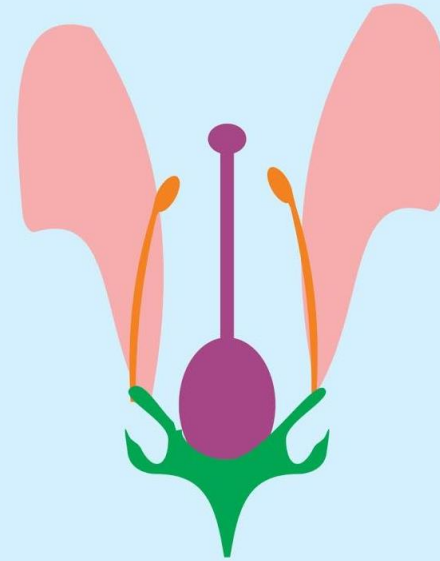
**nadcvjetan**

*epigini cvijet*



**podcvjetan**

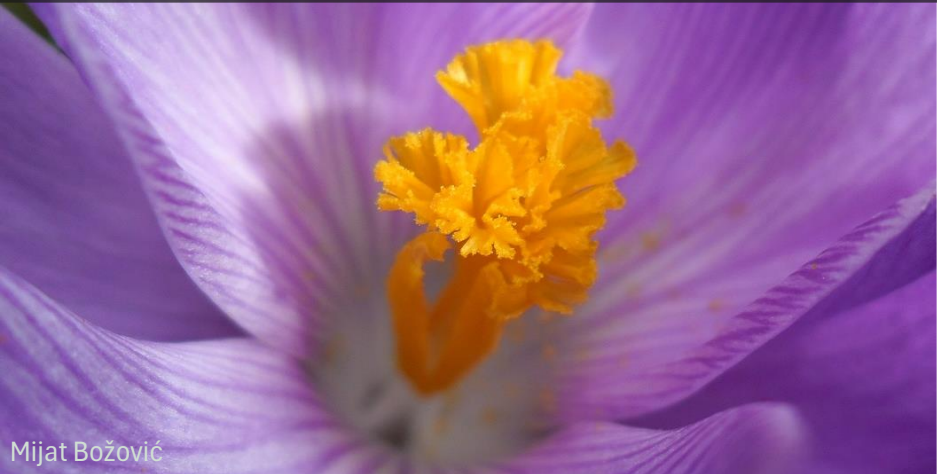
*perigini cvijet*



**sredcvjetan**



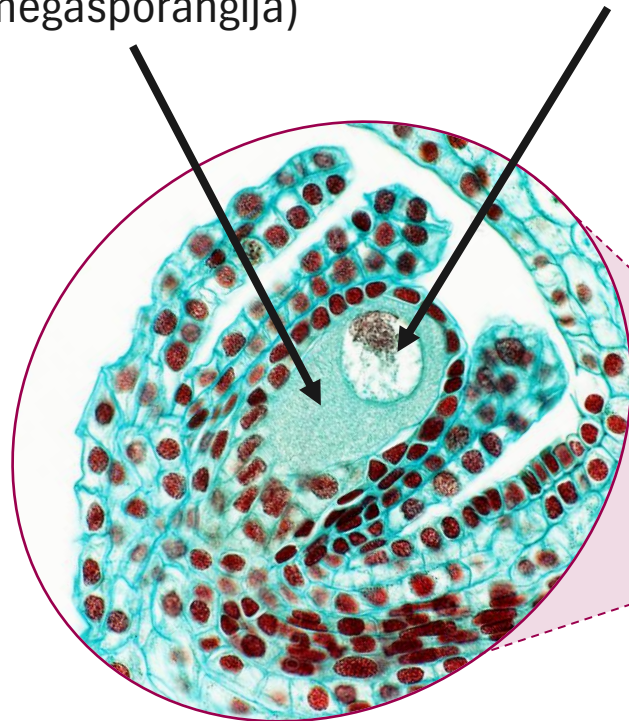
# Izgled žigova tučka



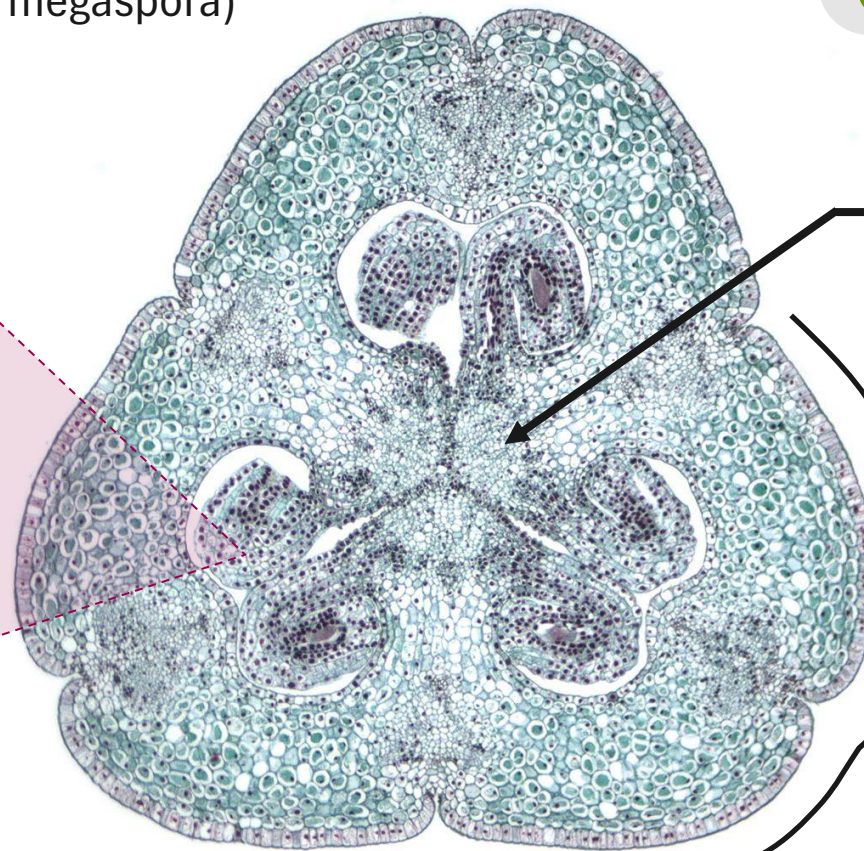
# Ovarium

**nucelus**  
(megasporangija)

**arhesporijum**  
(majka ćelija megaspora)



**sjemeni  
zametak**

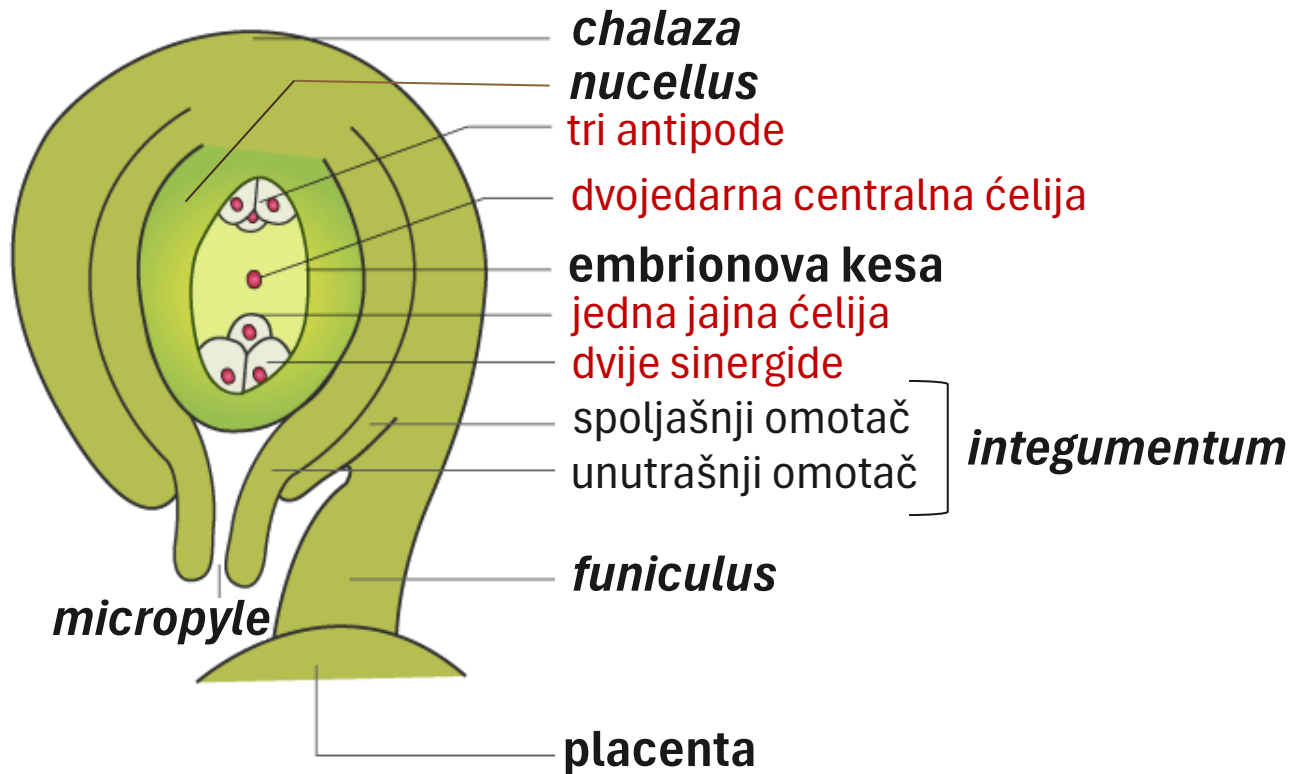


**placenta**

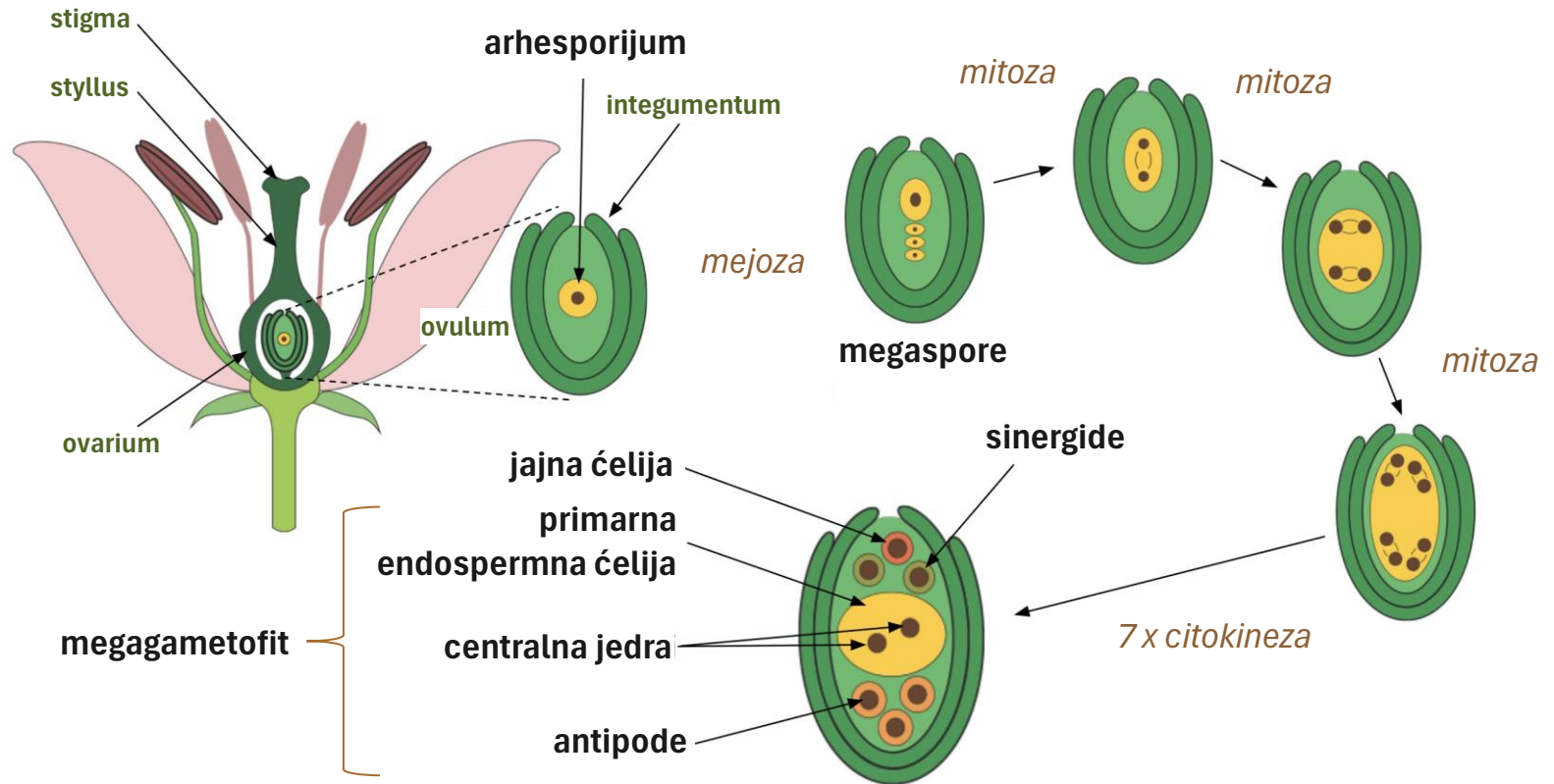
**karpela**



# Ovulum



# Megasporogeneza i megagametogeneza



# Nektarije

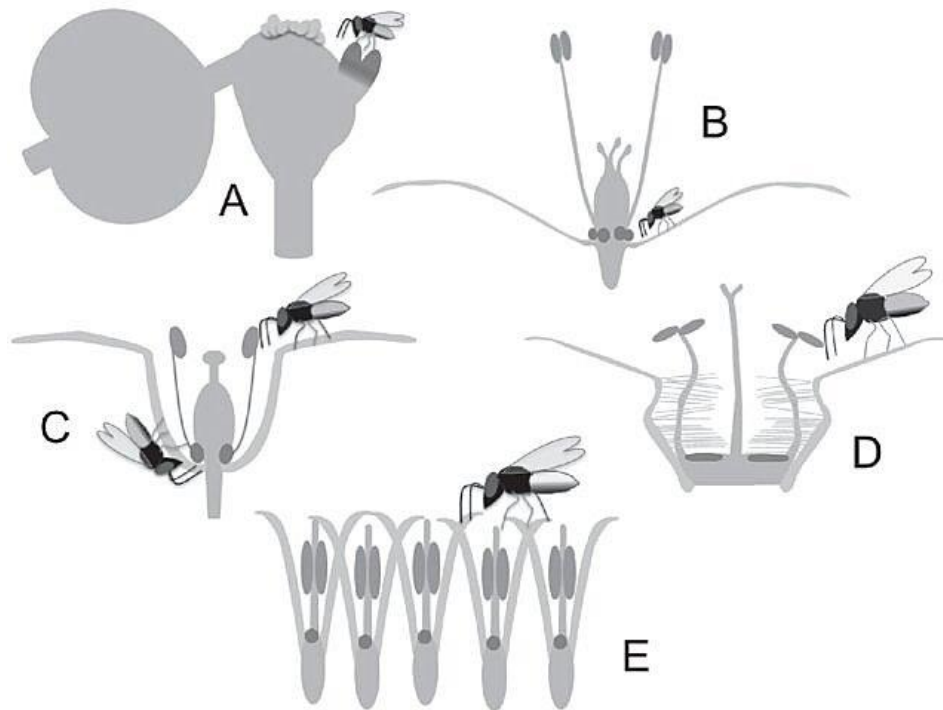
A close-up photograph of a flower's center. The image shows a dense cluster of numerous stamens with light-colored, oval-shaped anthers. The central pistil is partially visible, showing green, fleshy-looking structures. The petals are a pale, almost white color, heavily speckled with dark purple or maroon spots and streaks. The overall appearance is that of a specialized flower, possibly from the genus *Asclepias*.



# Floralne i ekstrafloralne nektarije



# Nektarije mogu zauzimati različit položaj

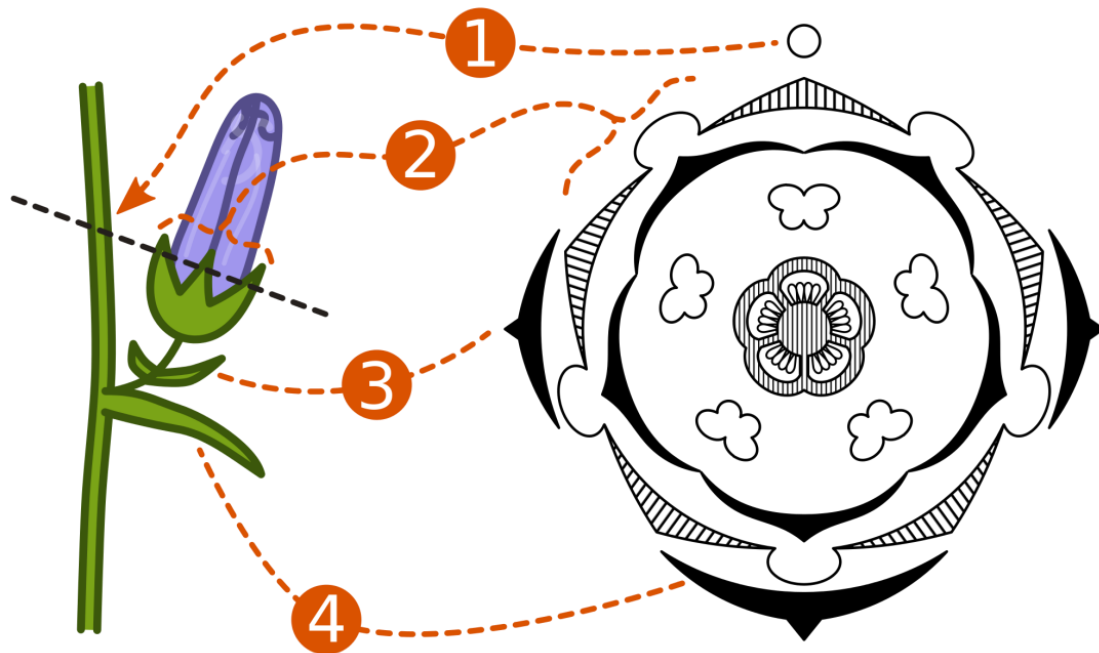




# Ostruga

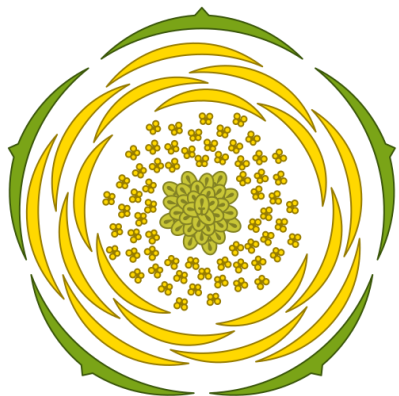


# Cvjetni dijagram

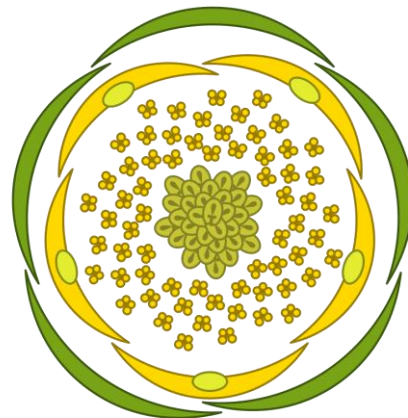
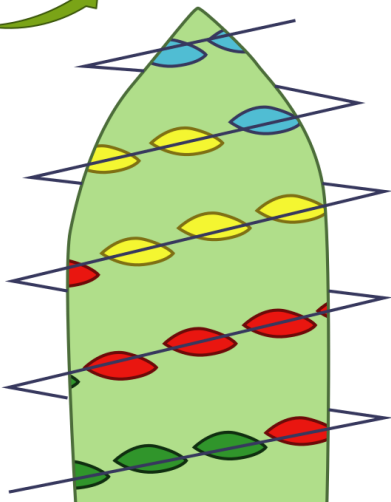


1. majka osa (glavna osa blizu cvijeta)
2. poprečni presjek cvijeta
3. brakteola
4. brakteja

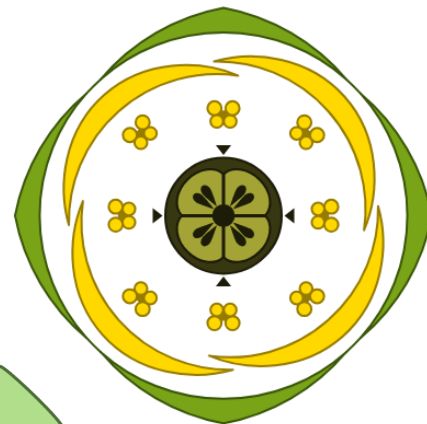
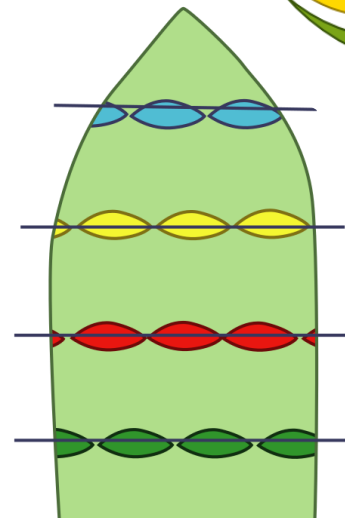
# Raspored cvjetnih djelova



acikličan



hemicikličan



cikličan



# Cvjetna formula

## raspored polova

♂ (muški) ♀ (ženski) ♂♀ (dvopolni)

## simetrija cvijeta

\* ili ⊕ (aktinomorfnost) % ili ↑ (zigomorfnost)

## djelovi cvijeta

**K** (čašica) **C** (krunica) **P** (perigon) **A** (prašnici) **G** (karpele)

## broj članova

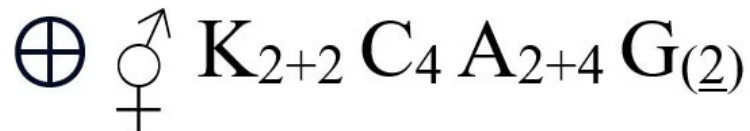
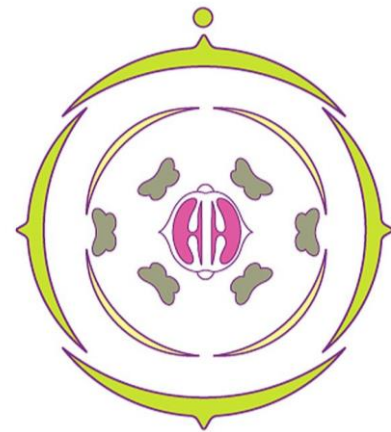
~ ili ∞ (veliki broj) **0** (izostanak)

## srastanje cvjetnih djelova

( ) za iste djelove [ ] za različite djelove

## položaj plodnika

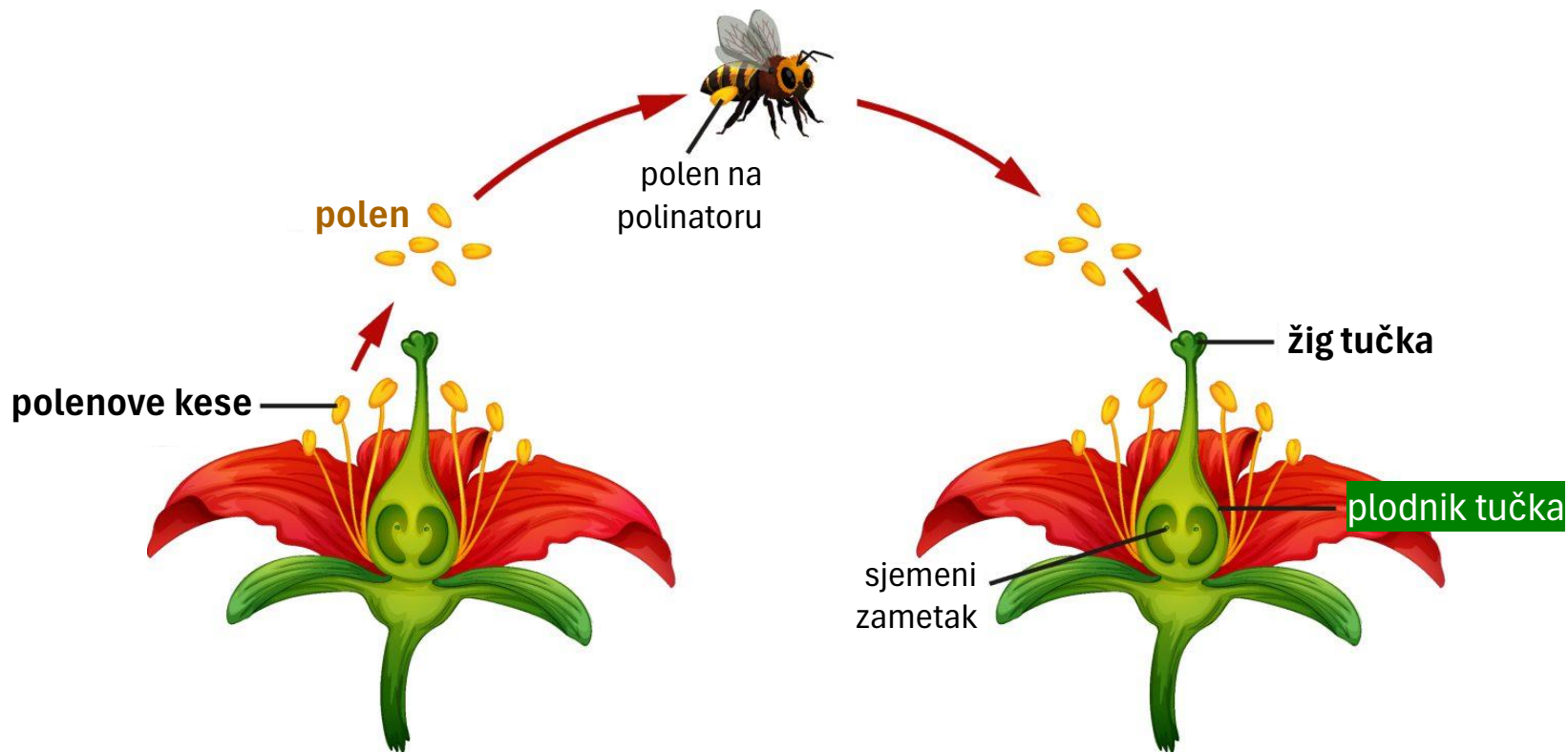
(nadcvjetan) (podcvjetan)



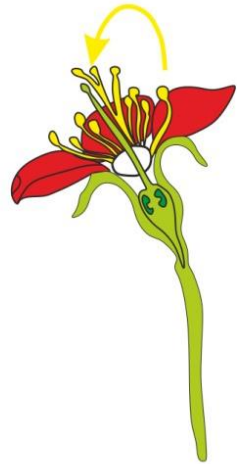
# Polinacija



# Oprašivanje je prenošenje polena na žig tučka



# Unakrsno i samooprašivanje



*autogamija*



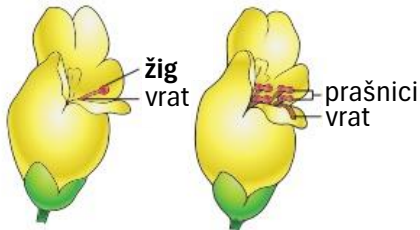
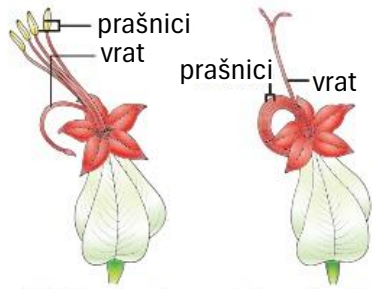
*geitonogamija*



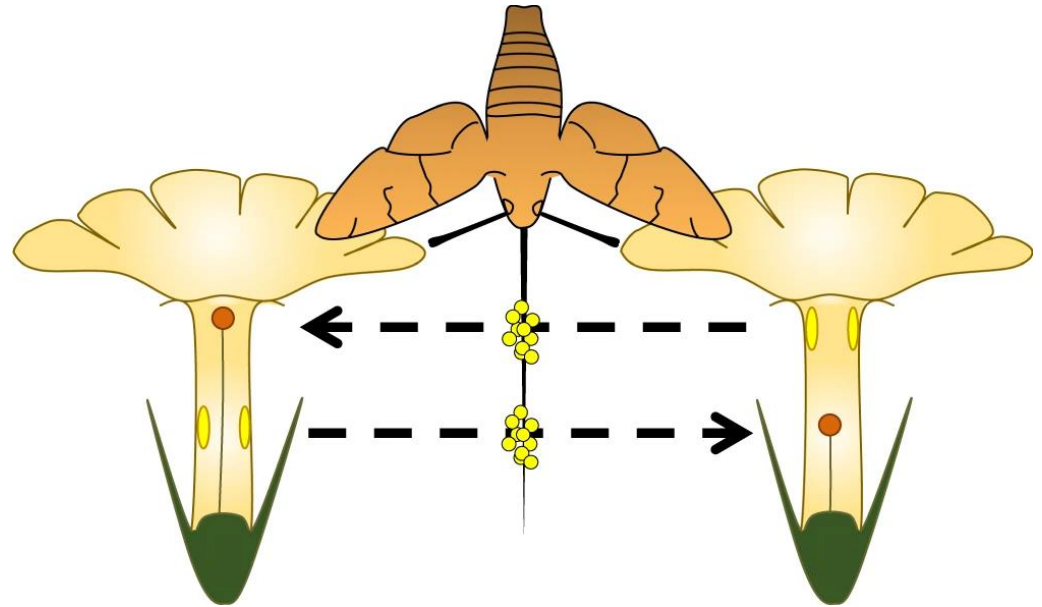
*kšenogamija*

# Mehanizmi sprječavanja autogamije

## protandrija



## protoginija



## heterostilija

# Tipovi oprašivanja

abiotičko



*anemofilija*



*hidrofilija*

biotičko



*entomofilija*

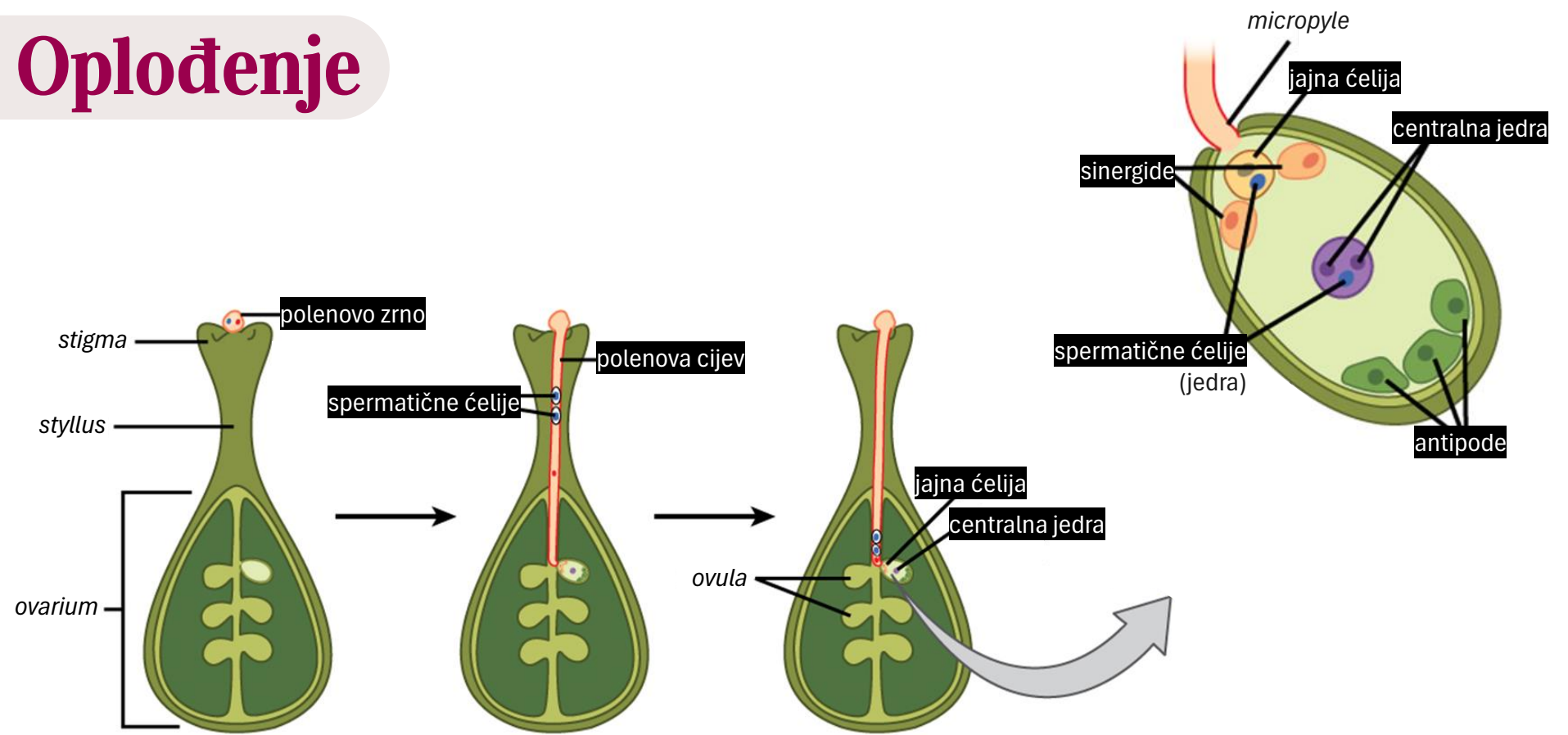


*ornitofilija*

# Oprašivanje prevarom



# Oplođenje

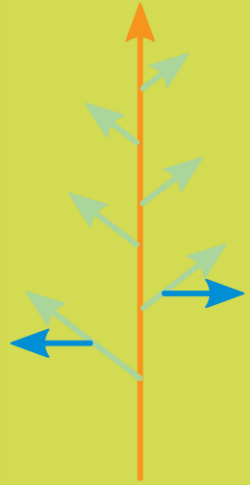




# Inflorescentia



# Dva tipa cvasti



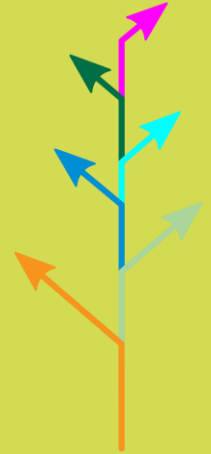
*monopodijalno  
grananje*



**racemozna**

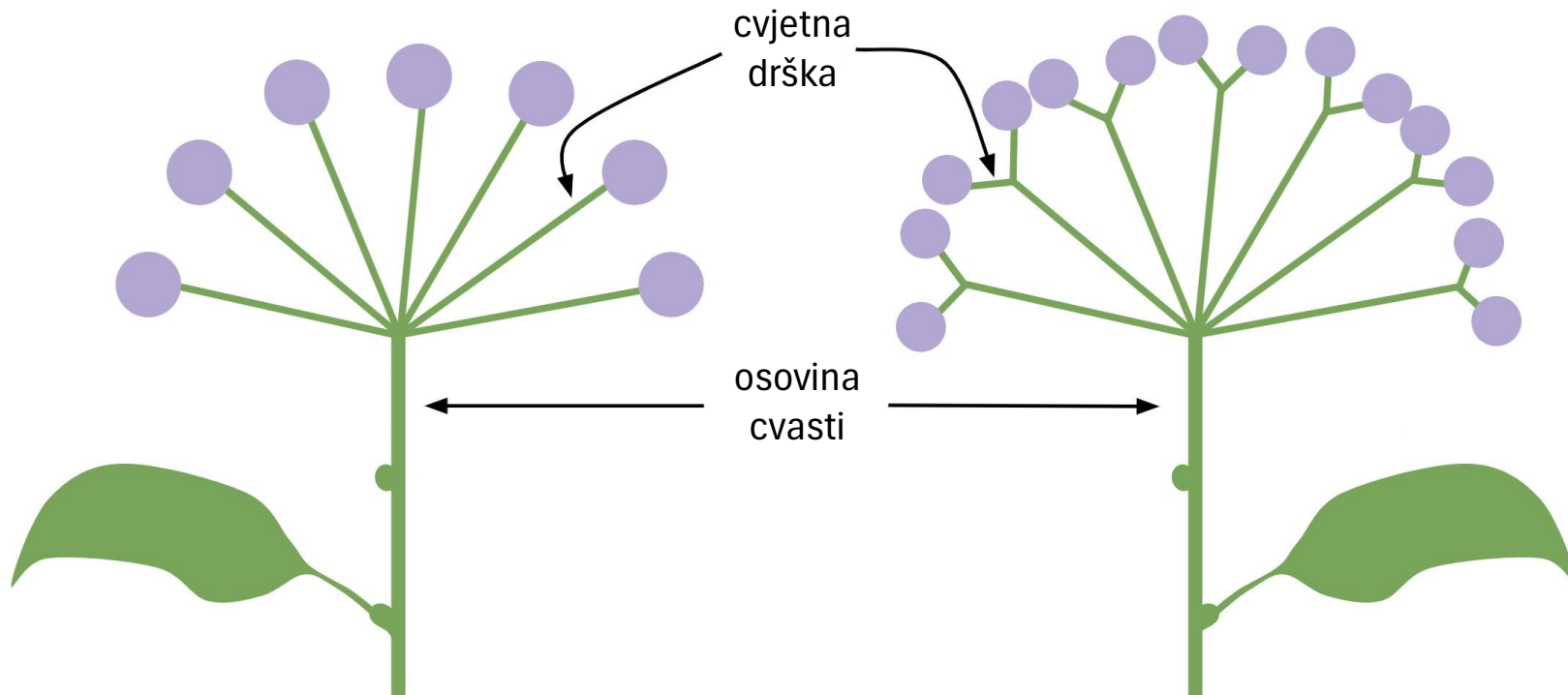


**cimozna**

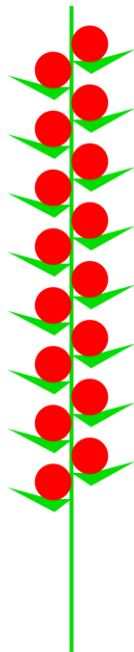


*simpodijalno  
grananje*

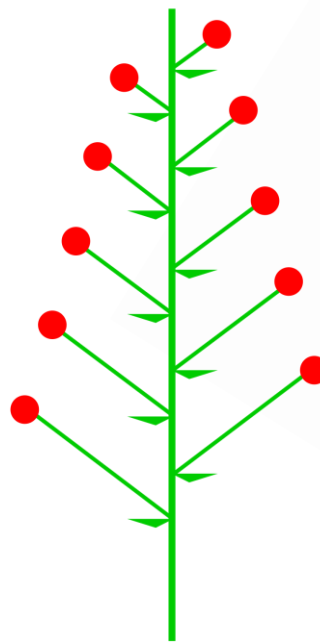
# Proste vs. složene cvasti



# Osnovne racemozne cvasti



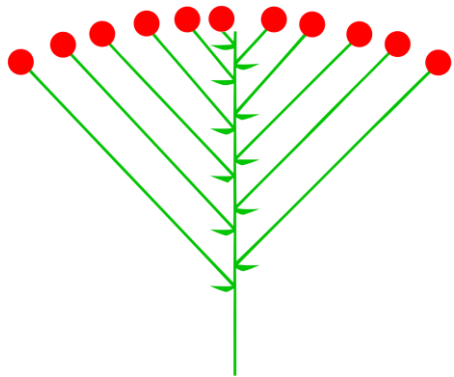
spica



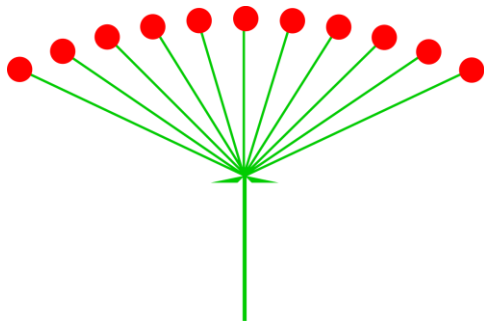
racemus



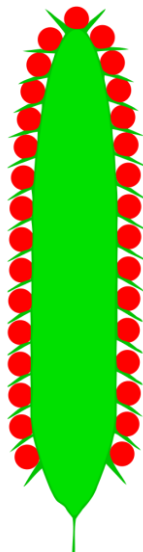
# Ostale racemozne cvasti



**corymbus**



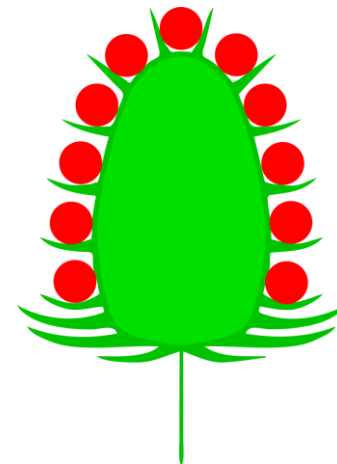
**umbella**



**spadix**



**amentum**



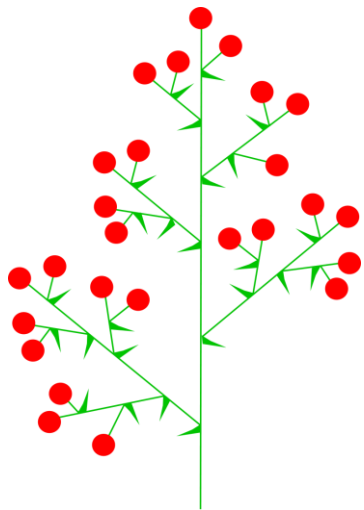
**capitulum**



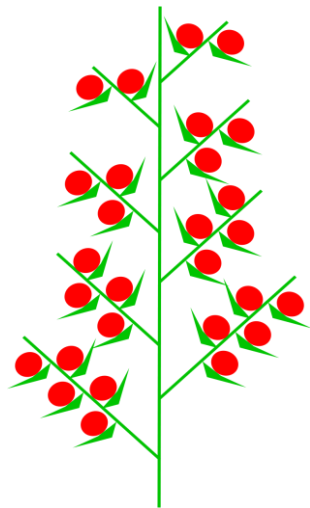
# Primjeri racemoznih svasti



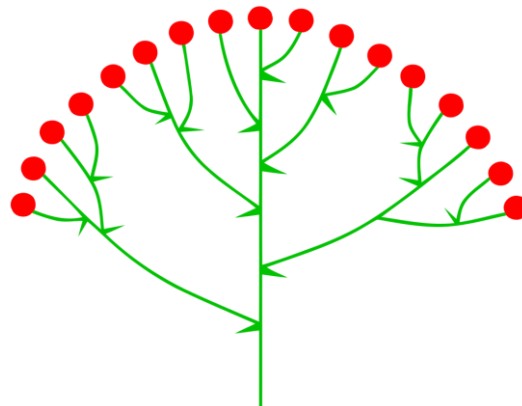
# Složene racemozne cvasti



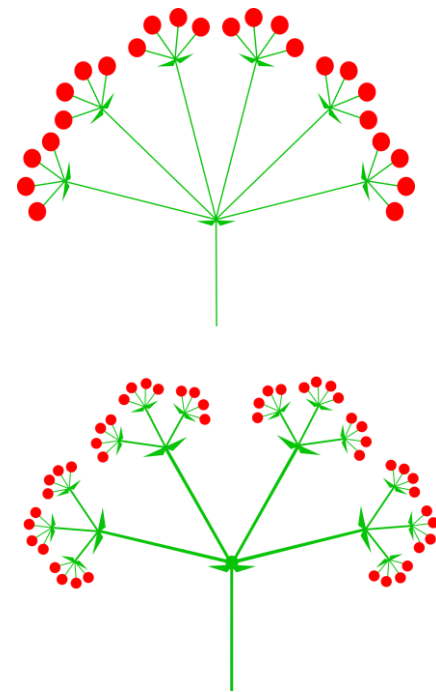
metlica  
(panicula)



složeni  
klas

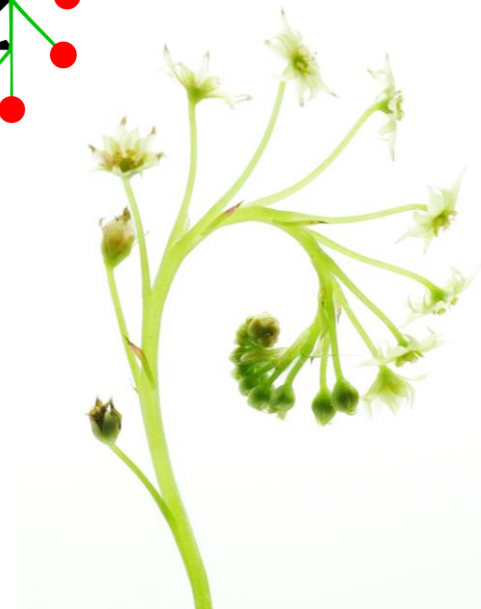
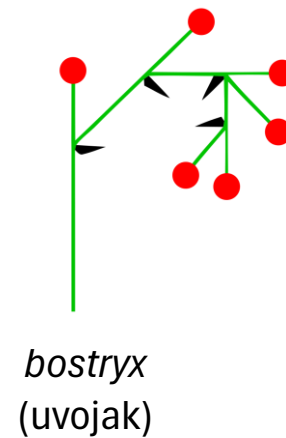
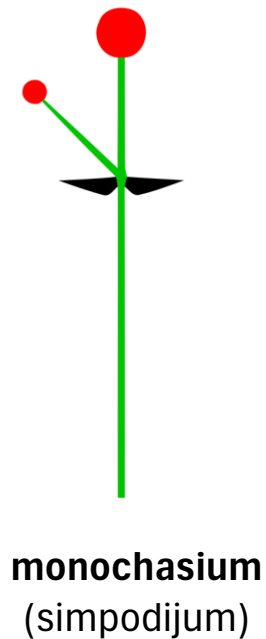
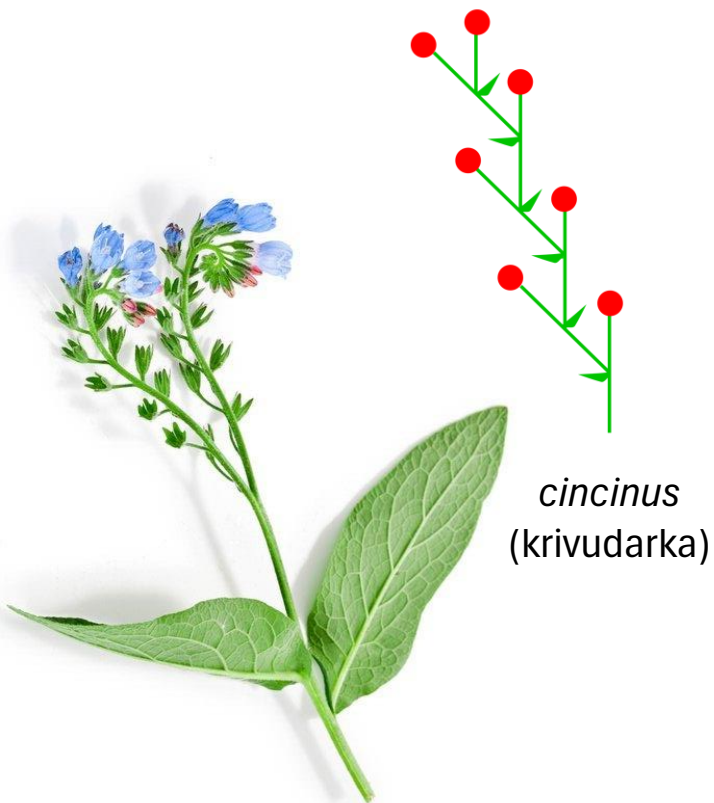


složena  
gronja



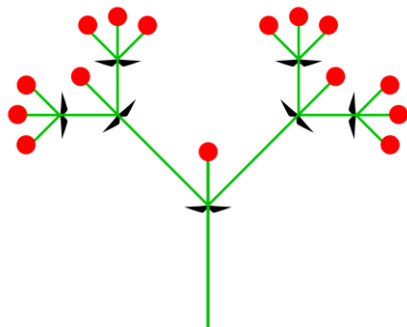
složeni  
štit

# Osnovne cimozne cvasti

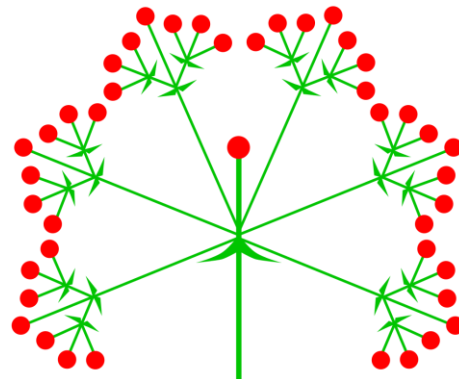




# Ostale cimozne cvasti



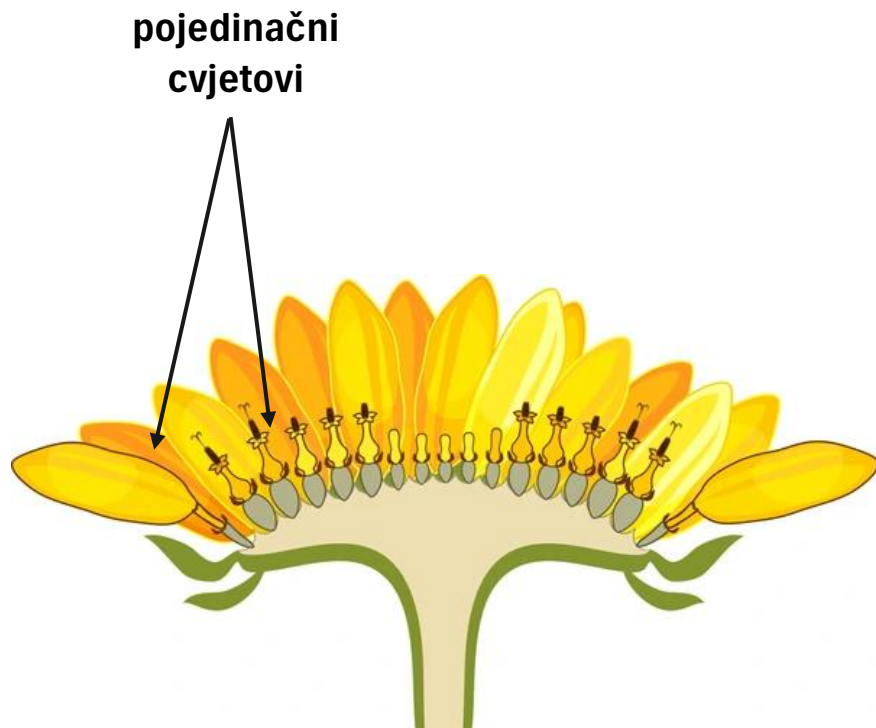
dichasium



pleiochasium



# Pseudantium: cvast koja liči na cvijet





# Involukrum i involucelum



Botanika

Mijat BOŽOVIĆ

# Pitanja?

