Yeasts and yeast-like organisms related to fruit trees

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Culture Colection of Yeasts
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Nutritional value of fruits

- Sugars
- Minerals
- Vitamins
- Fibre
- Bioactive compounds (i.e. carotenoids, polyphenols, flavonols, anthocyanins, etc.)

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Functions of fruit trees

- Oxygen production
- Carbon sequestration
- Erosion control of soil
- Source of food for polinators
- Protection from sun and wind; reduction of air temperature
- Aesthetic value; scent ⇒ stress reduction
- **All parts of trees harbour diverse microorganisms**

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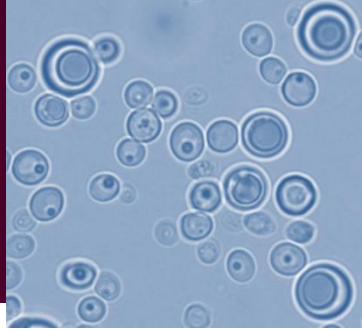
Main activities of microorganisms



- Contribution to the cycling of essential elements (N, P, S, C, O)
- Supporting of the plant growth and health
- Protection against plant pathogens
- Utilization of substances released by plants
- Solubilization of some substances to be more available to plants

Ecosystem functionality strongly depends on microbial diversity

- Study diversity, dynamic and functions of microbiota present on aboveground and belowground parts of plants
- Isolate and identify microorganisms
- Examine properties of isolated strains (enzymatic and antagonistic activities, stimulation of plants, etc).
- Maintain microbial strains isolated

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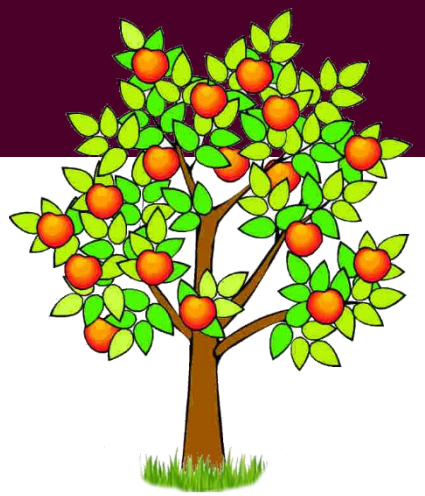
Factors which influence yeasts inhabiting aboveground plant organs



- Locality
- Climate conditions (temperature, humidity, UV light, dessication, wind)
- Availability of nutrients (honeydew, pollen, compounds relased by leaves or present in blossoms and fruits)
- Pollution by chemicals
- Application of pesticides and fertilizers
- Age of plant organs (fruits, leaves and blossoms)

Knowledge on diversity of yeasts which inhabit fruit trees is still limited

- Different fruit trees of the Rosaceae family (apple, pear, plum, peach, apricot trees)
- Two localities in southwest Slovakia
- Isolation of yeasts by traditional plating technique
- Leaves - two seasons (spring and autumn)
- Fruits and blossoms - two consecutive years
- Soil under the trees - four sampling periods

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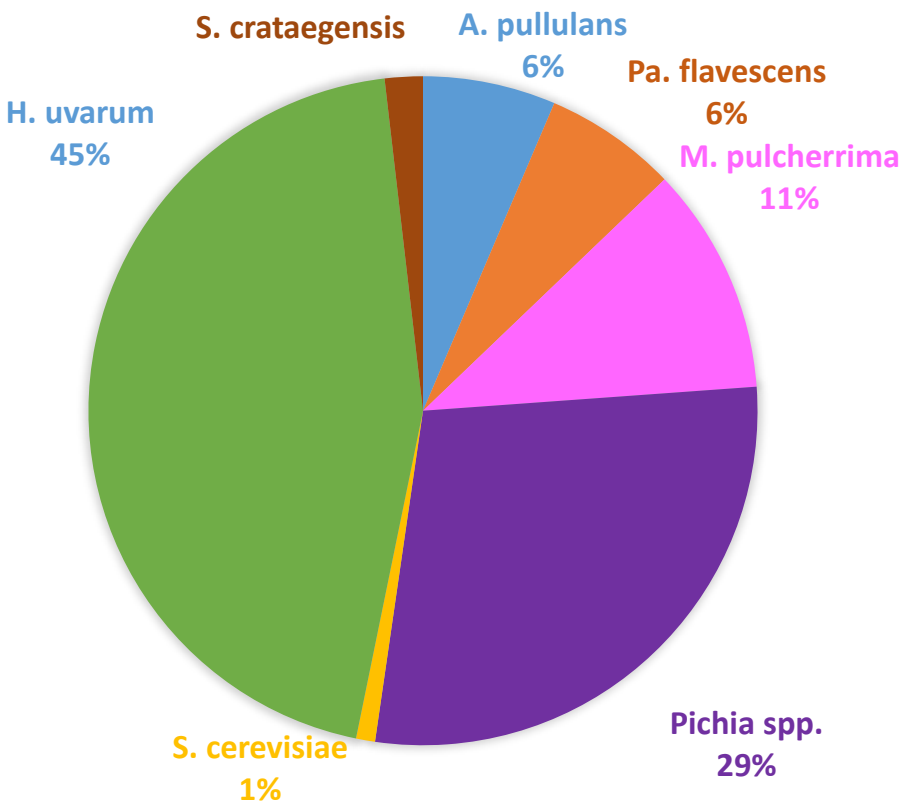
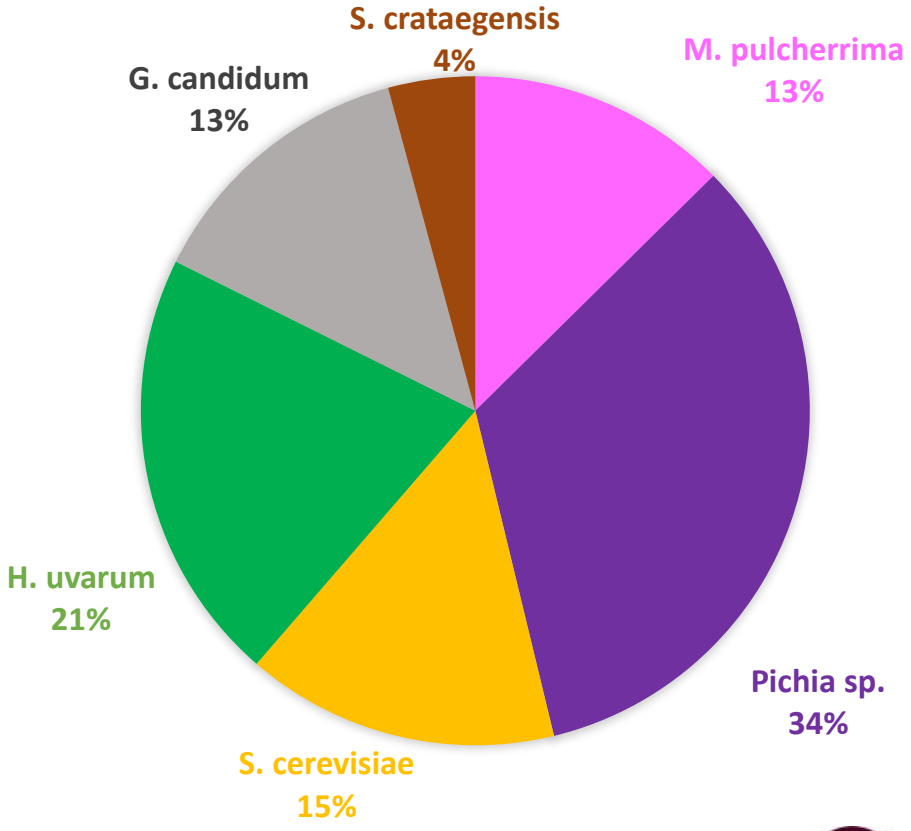
Yeasts isolated from fruits during two consecutive years





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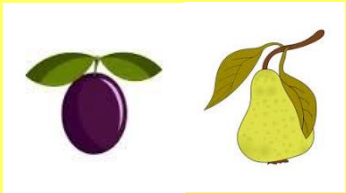
Other species isolated (22 species)

- *Bullera alba; Candida oleophila;*
- *Debaryomyces hansenii; Galactomyces candidum;*
- *Hanseniaspora opuntiae; Pichia fermentans;*
- *Pichia kudriavzevii; Pichia membranifaciens;*
- *Pichia manshurica; Meyerozyma guilliermondii;*
- *Rhodotorula mucilaginosa;*
- *Starmerella stelimalicola; Saccharomyces paradoxus;*
- *Wickerhamomyces anomalus;*
- *Zygosaccharomyces baillii;*



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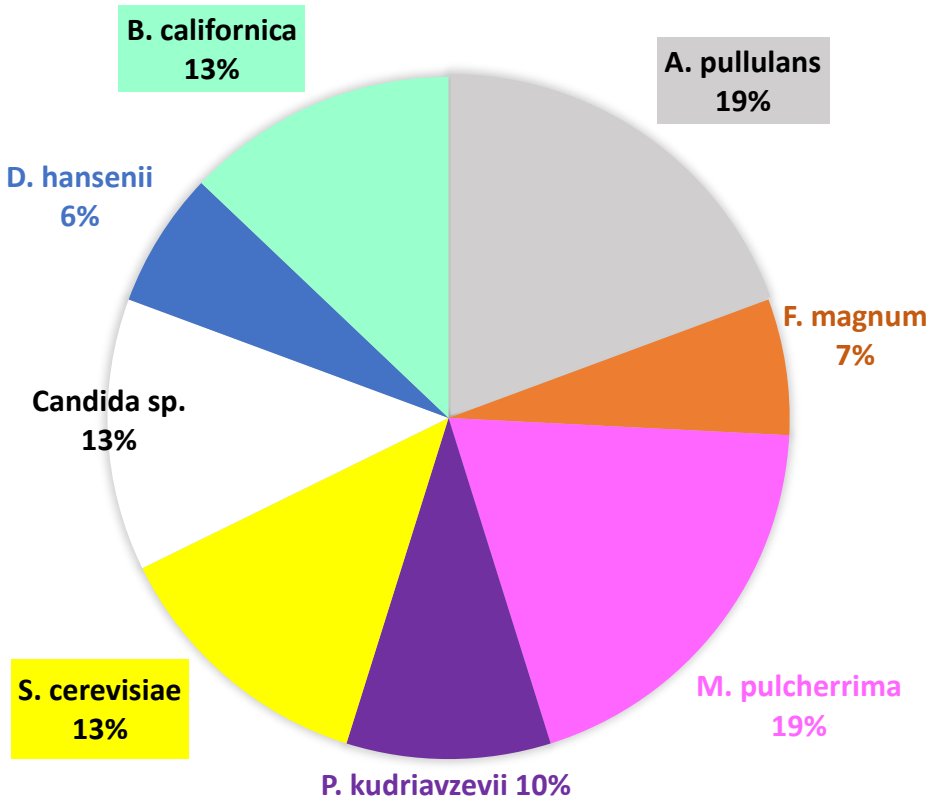
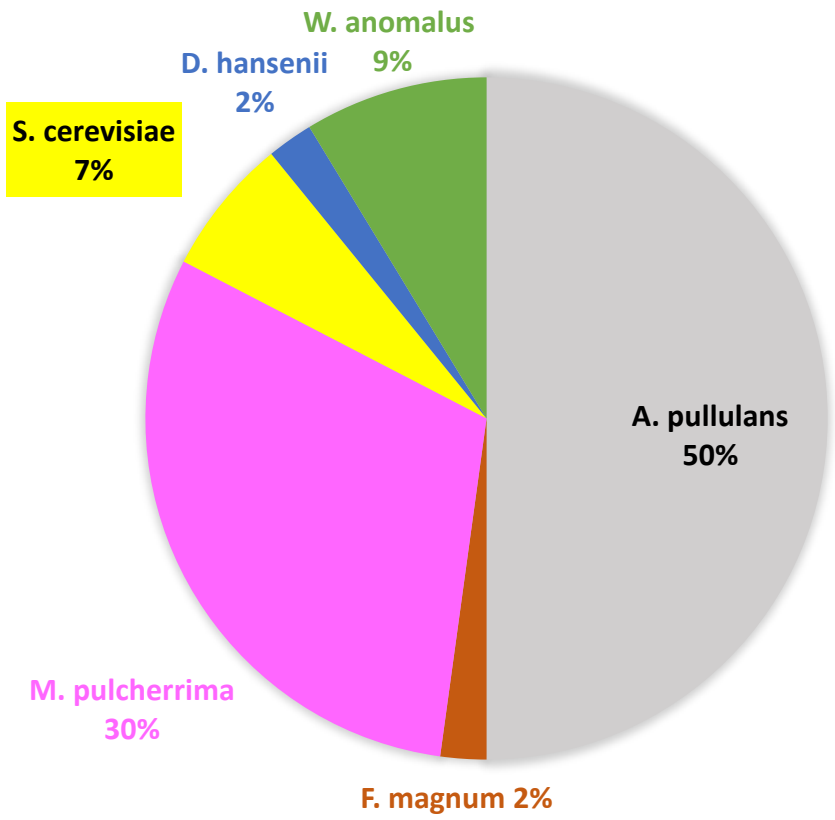
Yeasts associated with blossoms (2 years)





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Other species isolated (17 species)

- *Candida boidinii; Candida tropicalis;*
- *Candida parapsilosis; Diutina catenulata;*
- *Filobasidium floriforme;*
- *Galactomyces candidum;*
- *Meyerozyma guilliermondii;*
- *Starmerella bombicola;*
- *Starmerella magnoliae;*

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Leaves - extreme environment

- Fluctuation of humidity and temperature
- UV radiation
- Wind and rain
- Poor nutrient availability

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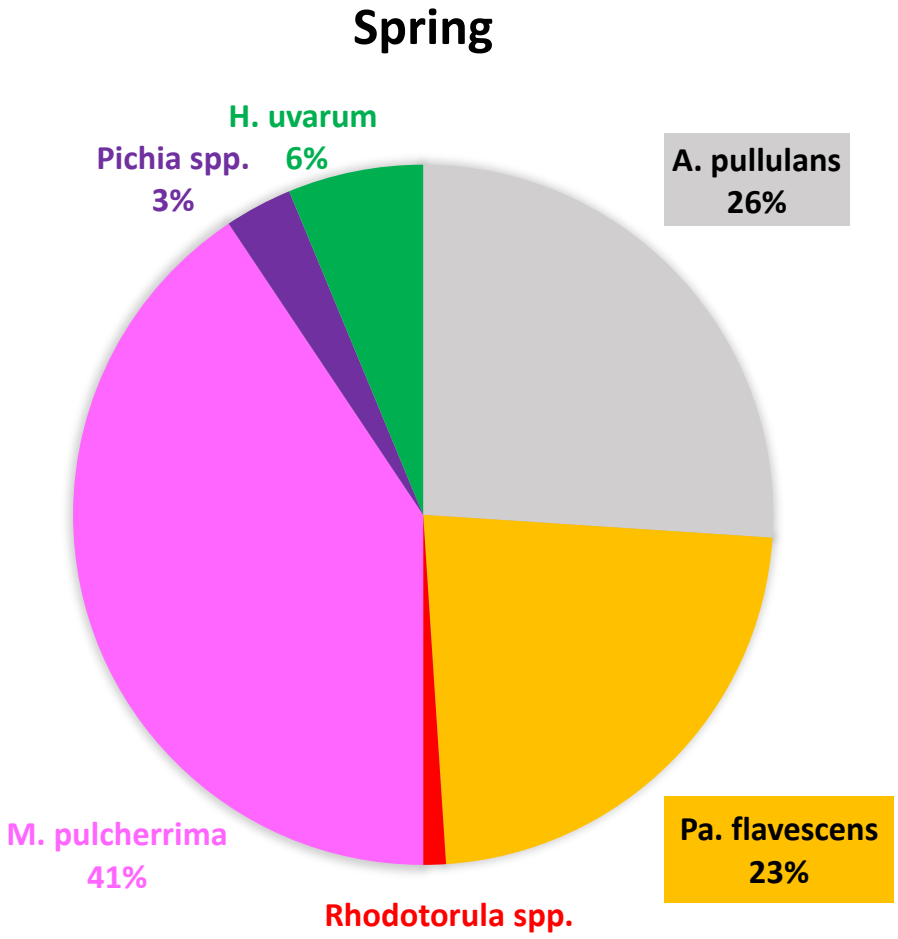
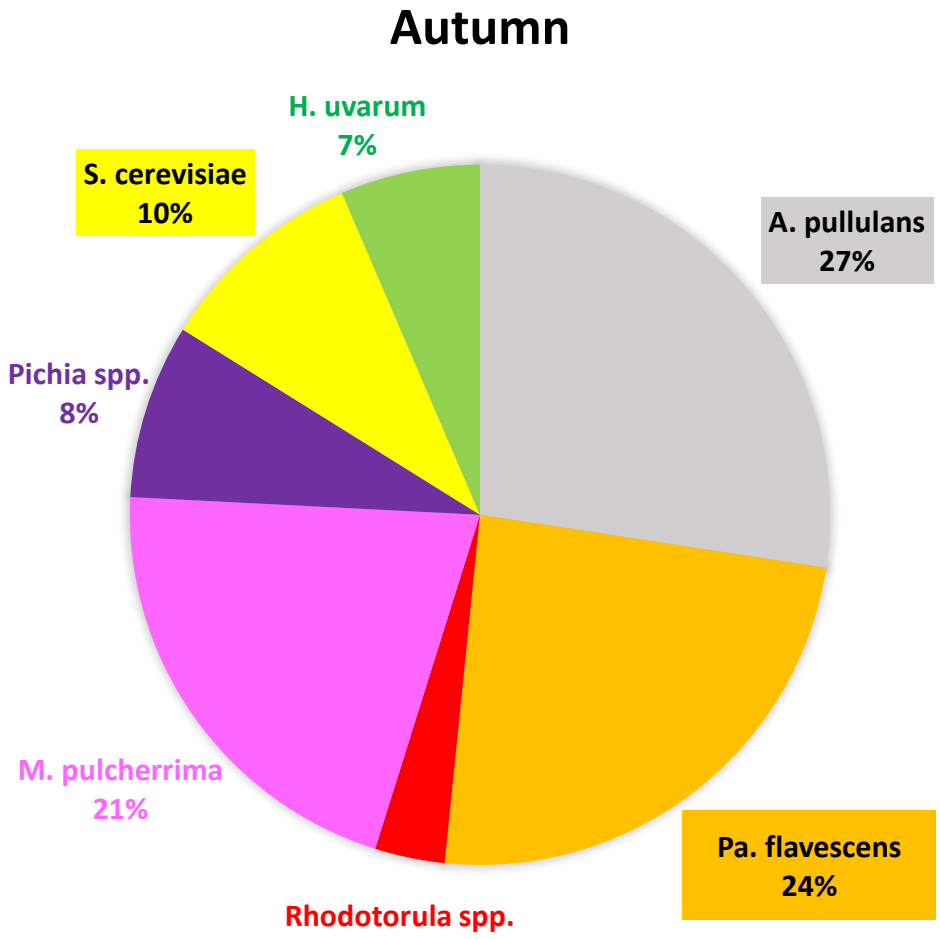
Yeasts associated with leaves of fruit trees





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Other species isolated (19 species)

- *Candida californica; Candida tropicalis;*
- *Galactomyces candidum; F. magnum;*
- *Meyerozyma guilliermondii; Pichia kudriavzevii;*
- *Pichia membranifaciens; Pseudozyma prolifica;*
- *Rhodotorula graminis; Rhodotorula kratochvilovae;*
- *Rhodotorula mucilaginosa;*
- *Saccharomycopsis crataegensis;*
- *Wickerhamomyces anomalus; Yarrowia lipolytica*

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Soil functions

- Keeps plants healthy and highly productive
- Provides plants with essential nutrients and water, serves as a solid medium for the roots, which enables them to clump together and allows the geochemical cycling of elements
- Serves as a habitat of various animals, plants and microorganisms, among them yeasts

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Diversity of yeast population in soil

- Type of soil
- Locality
- Season
- Application of agrochemicals (pesticides, fertilizers)
- Management regime of soil (till or digging to keep trunk bare of vegetation)

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Isolation of yeasts from soil adjacent to fruit trees

- Similar localities as were studied previously
- Soil beneath fruit trees is dug and treated with manure in late autumn
- Four samplings (June 13; October 13; October 14; April 15)
- Isolation of yeasts by traditional plating technique

- 59 yeast species found

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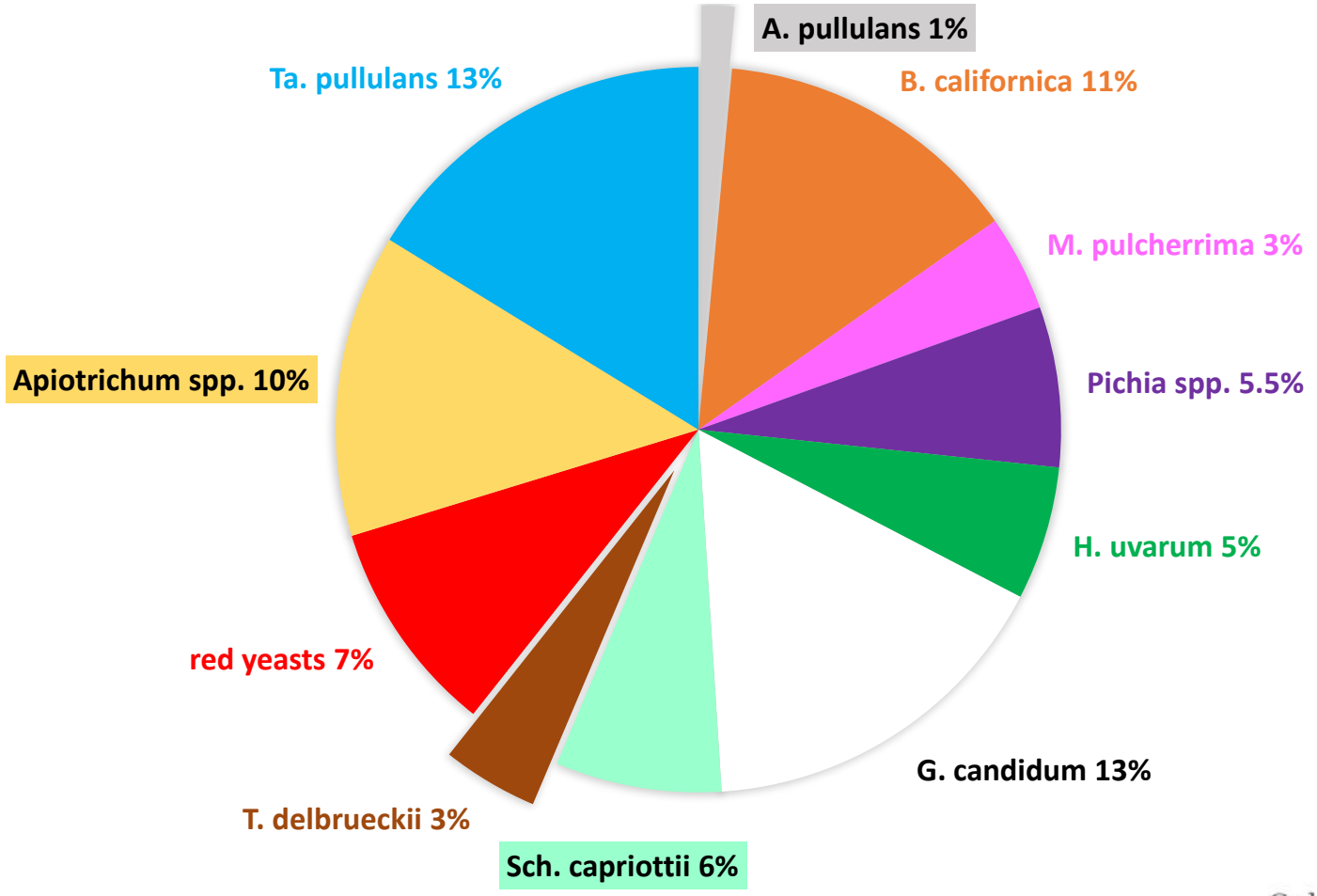
Samplings I to III
(June 2013, October 2013, October 2014)



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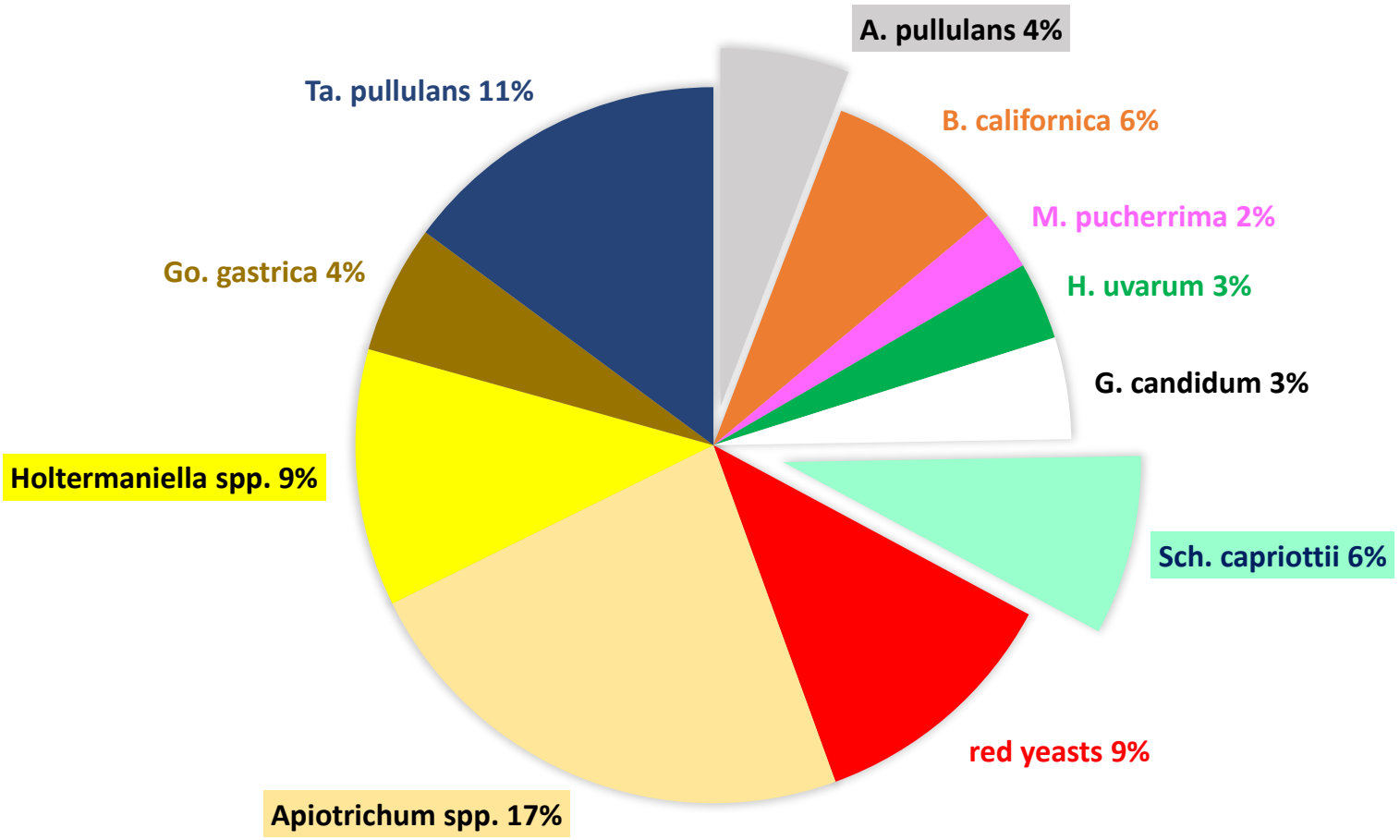
Sampling IV
(April 2015)



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Conclusions …

- Majority of the species isolated was similar for all aboveground plant organs; their frequency differed within individual plant organ and sampling period
- Leaves harboured mainly *A. pullulans* and *Pa. flavescens* ⟹ ability to protect from adverse conditions
- Fruits were inhabited mainly by yeasts (*Pichia, Hanseniaspora, Metschnikowia* - contribute to aroma of fruits)

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… conclusions …

- Soil - mainly pedobiont yeasts (*Barnettozyma californica, Schwanniomyces capriotti, Cyberlindnera misumaiensis, Tausonia pullulans*, *Apiotrichum* spp.,) most significant part of the yeast microbiota
- Fruit-related yeast species present in soil reflected aboveground yeast species
- Two new species found - *Wickerhamomyces* sp. and *Moniliella* sp.

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… conclusions

- Input of manure and leaf material into the soil in late autumn shifted yeast community from prevalent ascomyceteous to prevalent basidiomycetous yeasts
- Representatives of the yeast species isolated are deposited in the Culture Collection of Yeasts (www.ccy.sk)

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Thank you for your attention

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