# CLIMATE CHANGE AND BEE NUTRITION


Ing. Zuzana Juríčková, PhD.

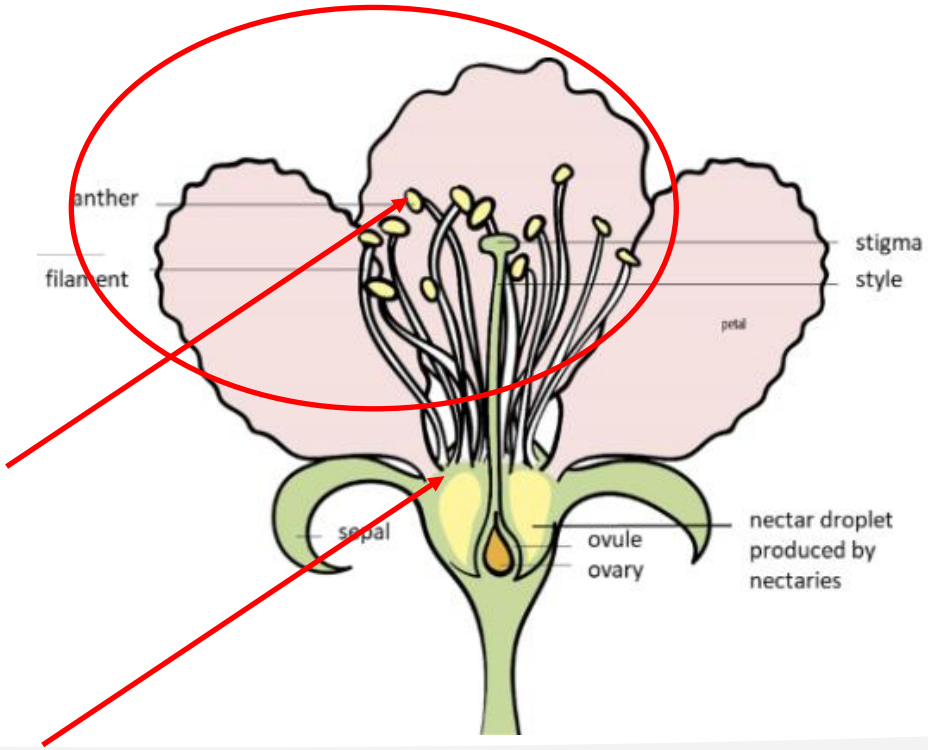
December 4th, 2025, Bratislava

- Bee survival problems and the connection with bee nutrition
- Natural food sources for pollinators and climate change
- Contamination from pesticides
- Threats to beekeeping due to international trade
- Useful measures for beekeeping and for wild pollinators

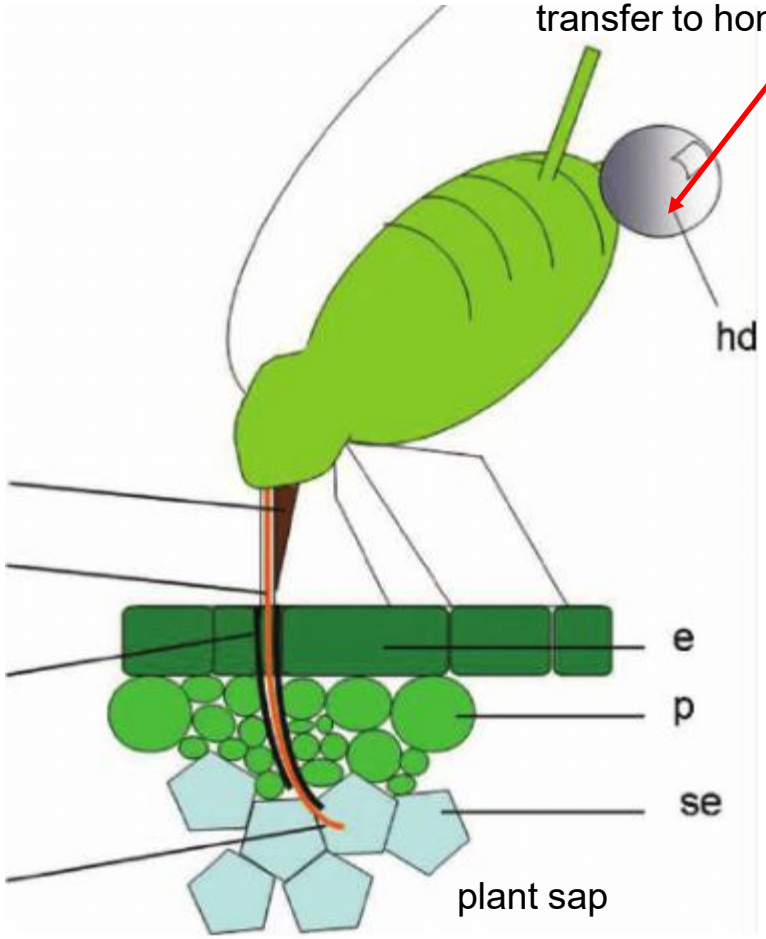
# Problems with bee nutrition

- **large winter losses and rapid flowering especially in S and SW Slovakia**
- **lower nectar production due to drought**
- **agrarian monoculture landscape**
- **poor nutrition weakens the immune system and causes a shorter life of bees**
- **long summer = many generations of bee parasites (mites)**
- **winteringbees wake up from hibernation before the flowers have time to bloom**

# Natural Feeds



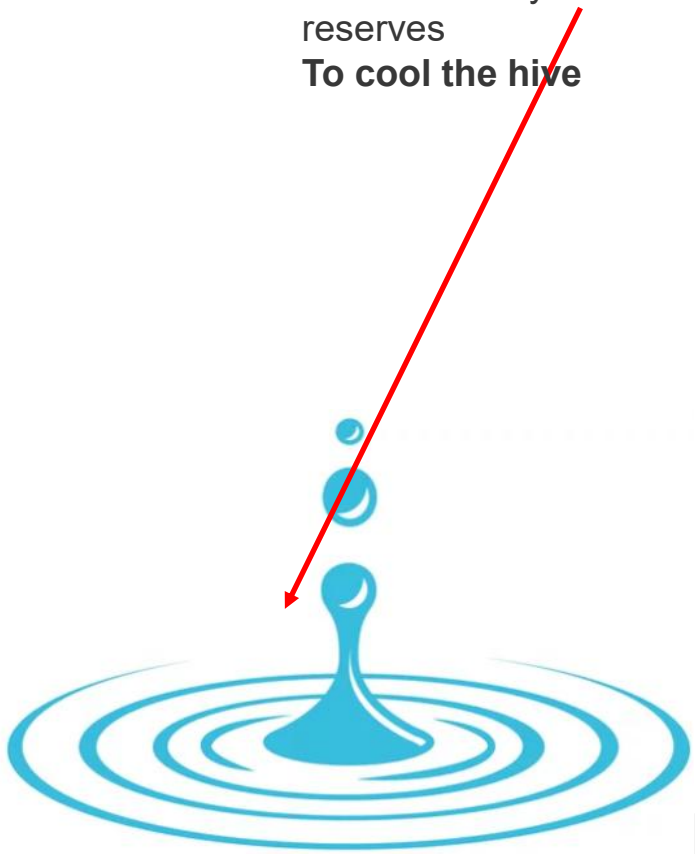

Aphids, cicadas, psylids, excrete sugars which bee transfer to honeydew




**Need of water to mix with pollen to prepare food for the brood**

To dissolve crystallized reserves

**To cool the hive**

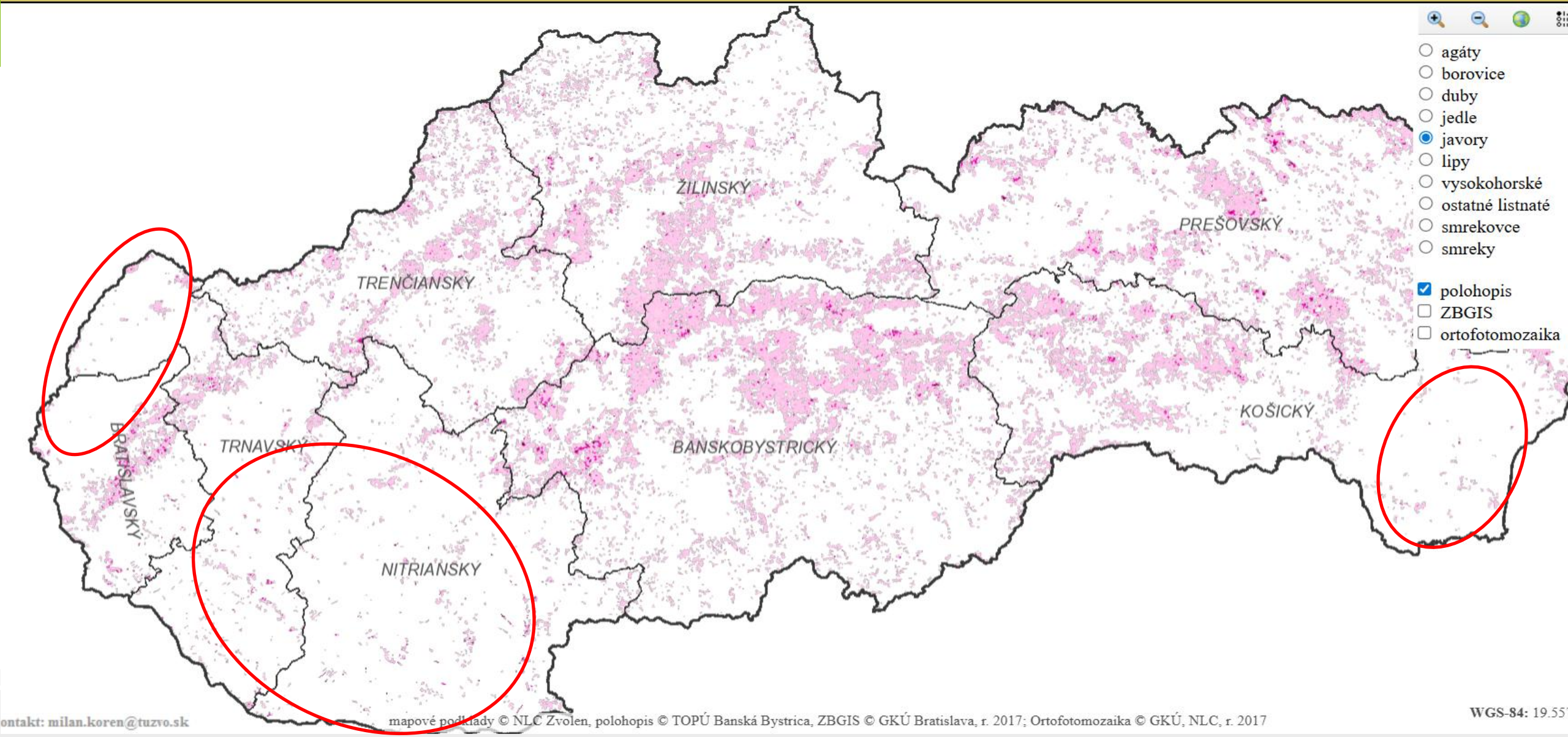


mapy.tuzvo.sk/vceliapastva/

# Lesná včelia pastva

Technická univerzita vo Zvolene

Ovládanie včelstvo.sk | gis.tuzvo.sk CEX




- agáty
- borovice
- duby
- jedle
- javory
- lipy
- vysokohorské
- ostatné listnaté
- smrekovce
- smreky

- polohopis
- ZBGIS
- ortofotomozaika

ontakt: milan.koren@tuzvo.sk



WGS-84: 19.55

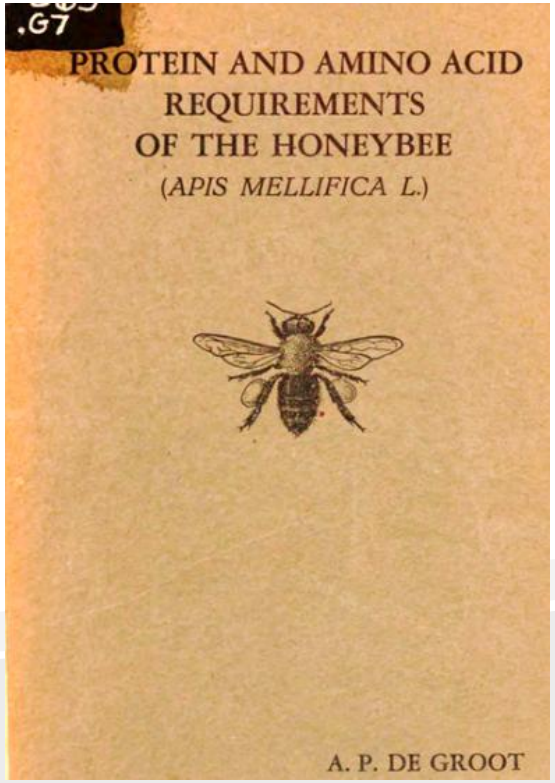
# PROTEINS - COMPOSITION OF DRY MATTER OF POLLEN(%)

| POLLEN | PROTEINS | FAT | SACHARIDS | MINERALS |
|---|---|---|---|---|
| Hazel | 50,16 | 0,16 | 21,58 | 4,20 |
| Pine | 14,14 | 1,23 | 30,92 | 2,24 |
| Birch | 23,02 | 2,67 | 16,96 | 2,97 |
| Willow | 54,45 | 0,56 | 19,02 | 3,21 |
| Alder | 18,94 | 3,02 | 17,35 | |
| Corn | 14.65 | 0,76 | 19,28 | 3,22 |

Pollen must have a protein level of at least 20% to meet the minimum dietary requirements of honeybees. High-quality pollen has 30% or more.

# COMPOSITION OF POLLEN

- **10 Essential Amino Acids for Bees**
- **If bees lack proteins with these amino acids, the colony will not thrive = less brood reared and shorter worker lifespan**




Anton P. De Groot (1953) identified a number of amino acids that are essential for normal growth and development of bees

https://scientificbeekeeping.com/scibeeimages/DEGROOT-OCR.pdf

# Functions of 10 Essential Amino Acids

Arginine – blood supply to tissues, accelerates regeneration, improves immune system

Histidine – supports the immune system and tissue regeneration, helps detoxify the body by binding heavy metals and protects nerve cells

Isoleucine – supports muscle recovery and protection

Leucine – supports muscle recovery and protection, improves physical performance

Lysine – helps with tissue growth and repair, protein formation, enzymes, supports the immune system, accelerates healing and reduces fatigue and stress

Methionine – to detoxify the body from heavy metals, is essential for protein synthesis, the formation of amino acids and hormones

Phenylalanine – supports the nervous system, the formation of proteins

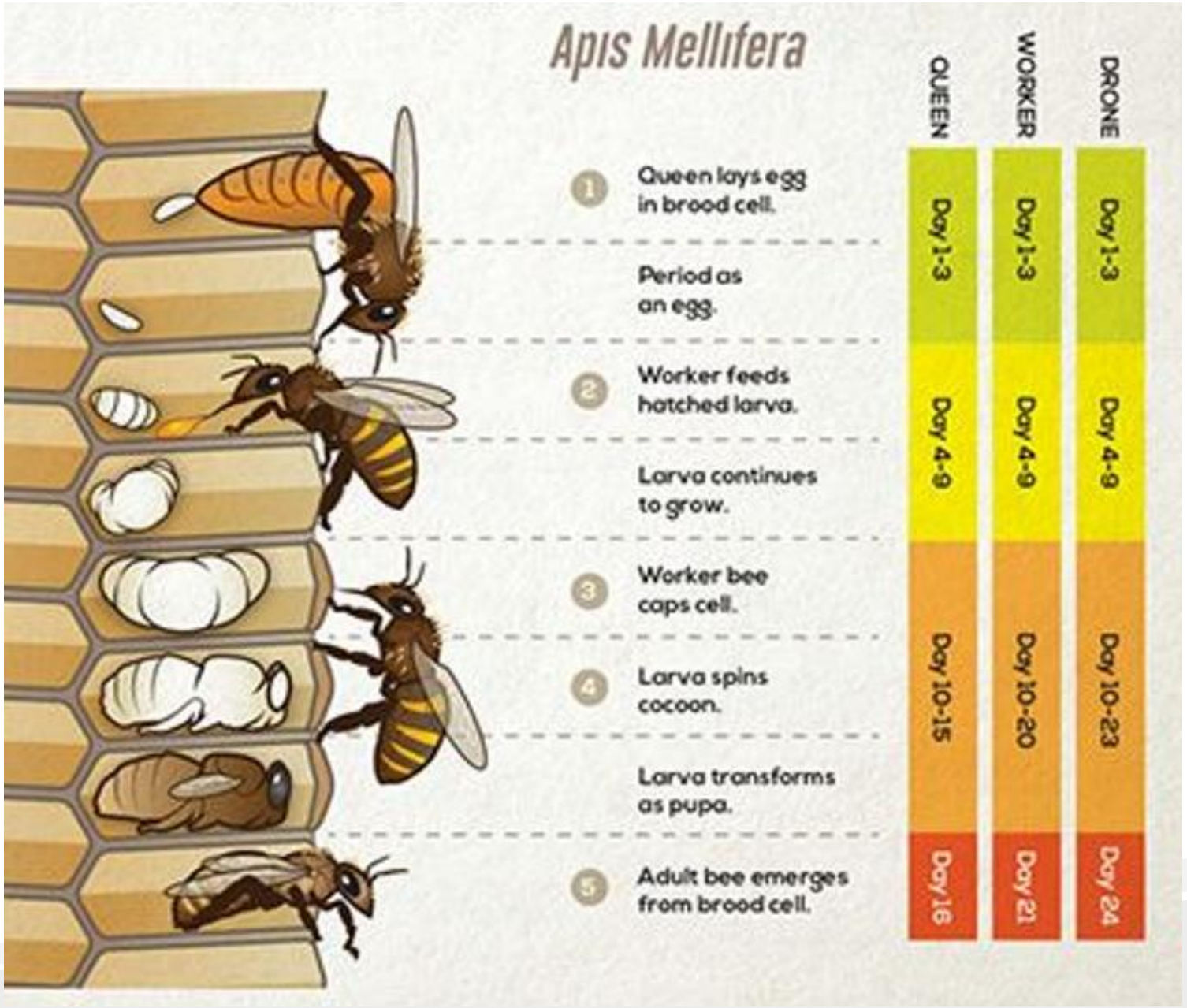
Threonine – beneficial for the immune system and the proper functioning of the nervous system, helps with absorption of nutrients and is important in the regeneration of the musculoskeletal system

Tryptophan - supports the proper functioning of the nervous system and stress managm.

Valine - helps reduce fatigue, support the immune system

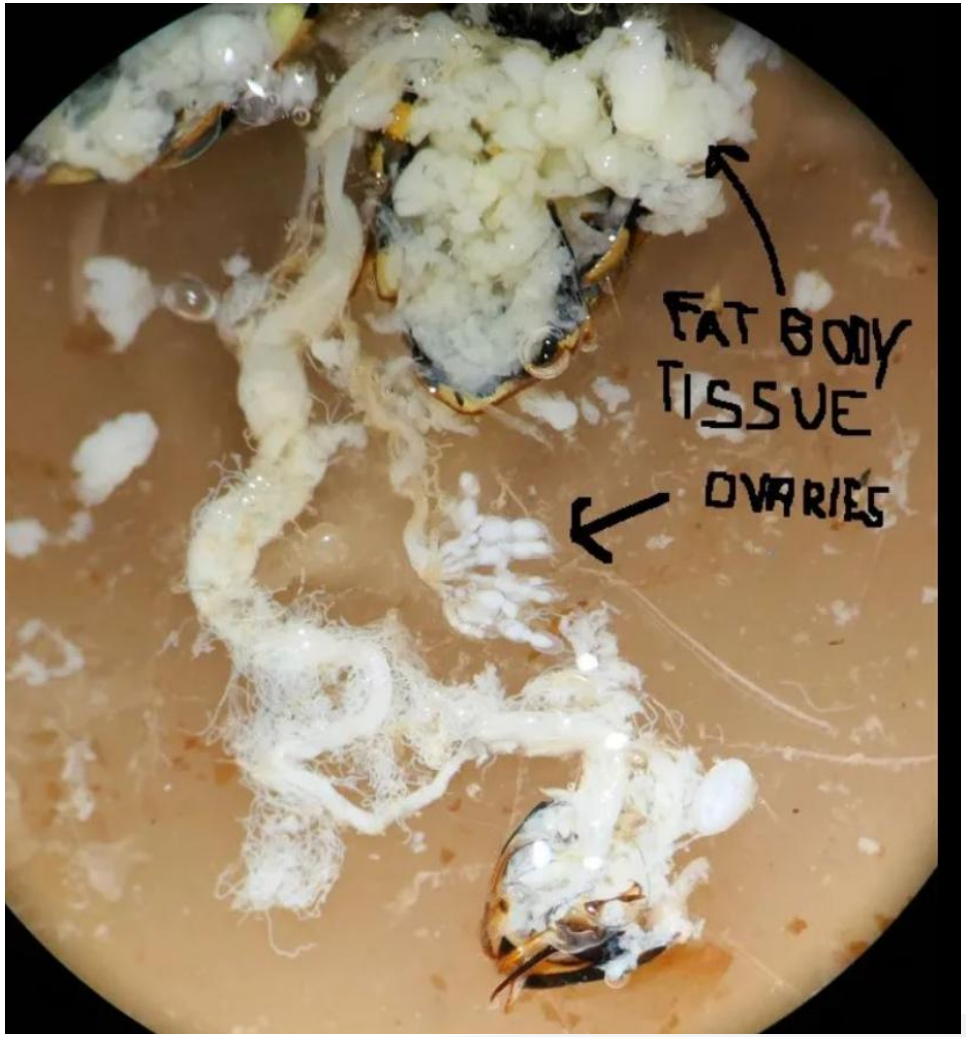
# Bee larvae nutrition

- Feeding of larvae with proteins rich of essential aminoacids  until the 9 th day is crucial for bee development



# FAT BODY OF BEES

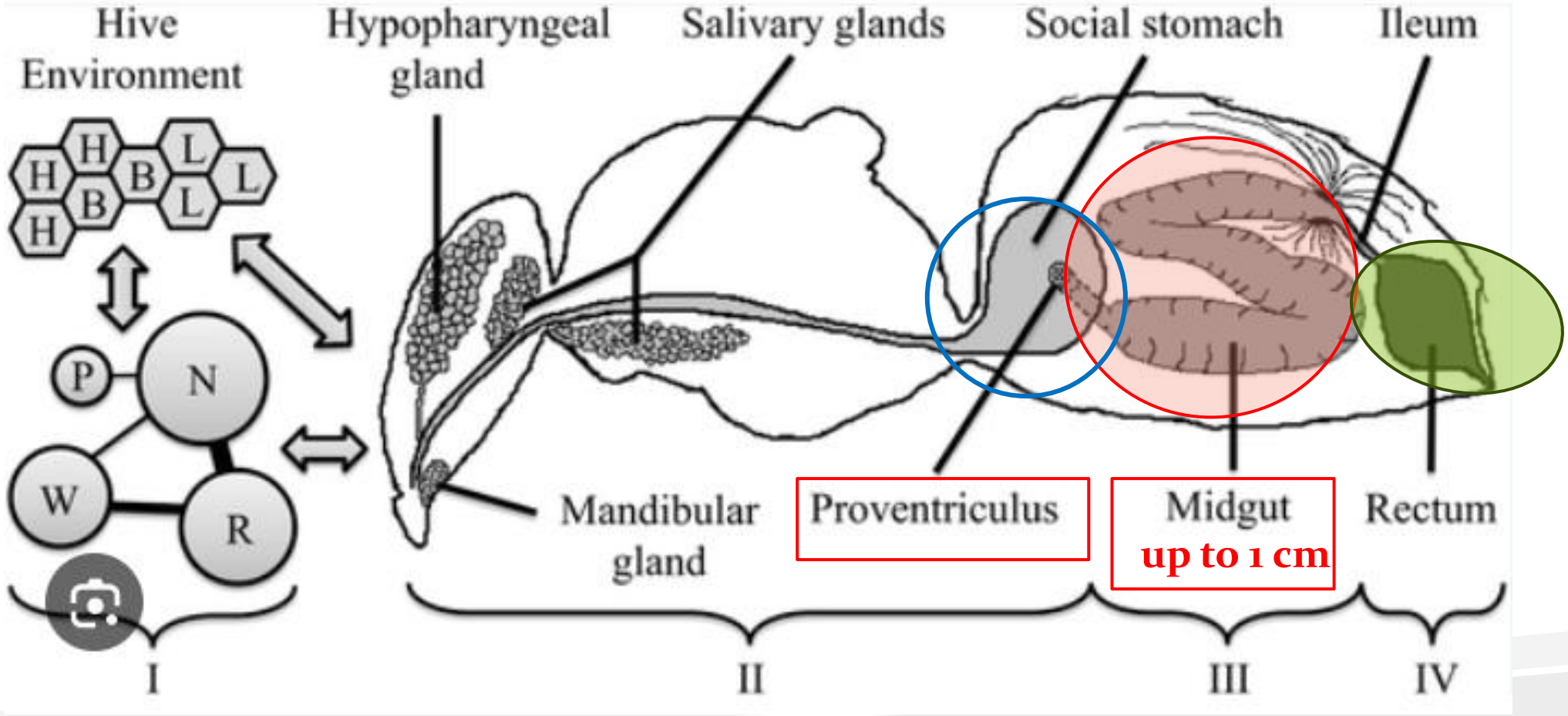
The bee's fat body is formed by consuming pollen during the larval stage.




Malnourished bee

Well fed bee

# HOW BEES DIGEST FOOD



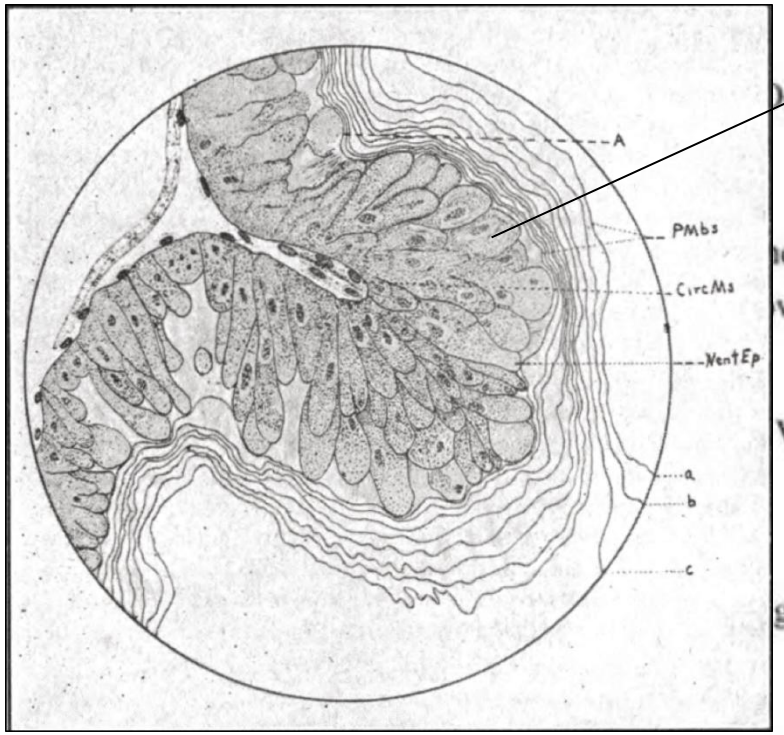

**food intake and enzyme supplementation**

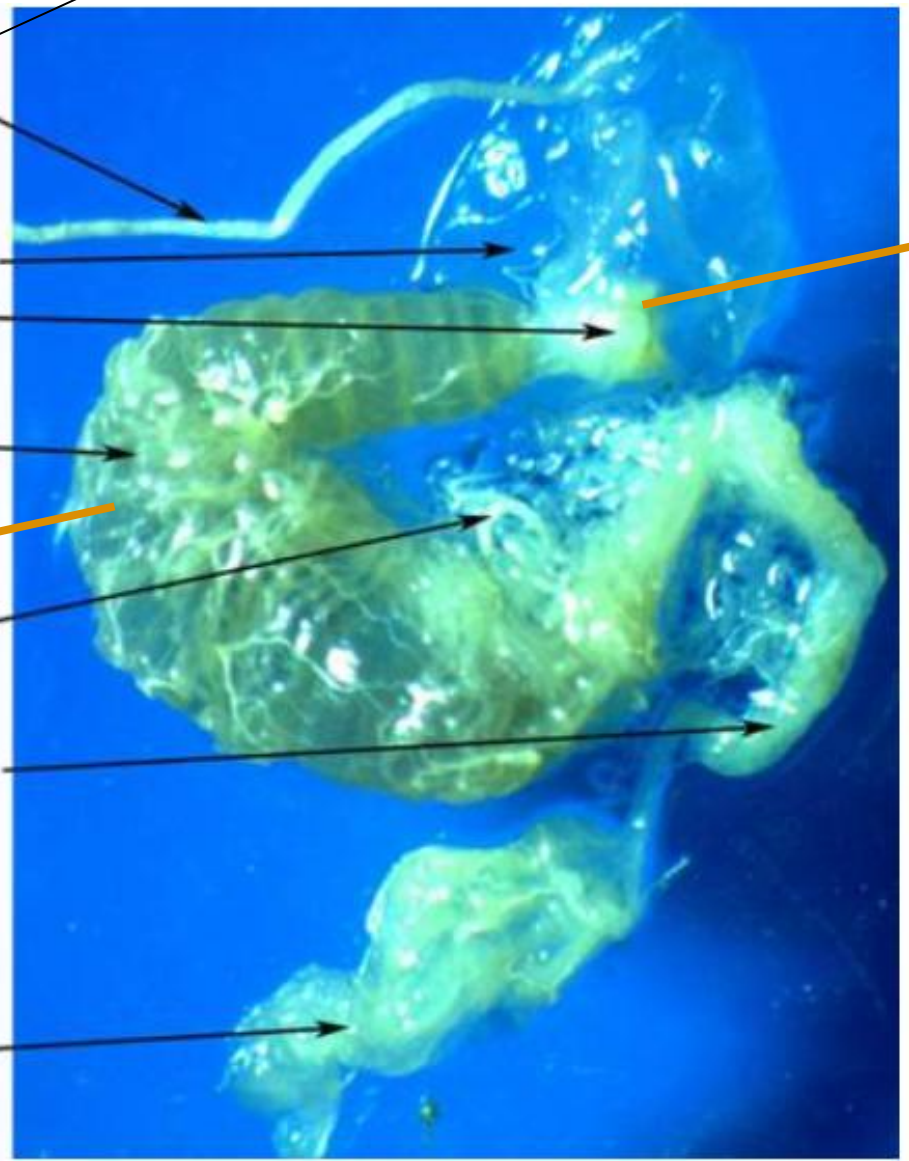
**digestion and absorption**

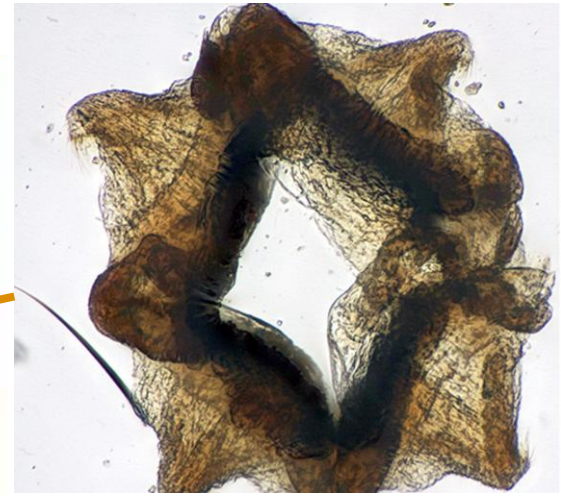
**removal of undigested nutrients**

# HOW BEES DIGEST FOOD II.

Snodgrassella, Gilliamella, Lactobacillus Firm-4, Lactobacillus Firm-5 a Bifidobacterium a i.



To increase the active surface, the stomach has villi for nutrient absorption, Nosema can reproduce here. Content occurs through production, and cells must be renewed in regenerative crypts. The layers of the protective peritrophic membrane protect the gastric mucosa.

**Rectum: up to 57% of the bee's weight during wintering.Reaches 9 mm and ø 4 mm**

# UNWANTED PESTICIDES - NEONICOTINODIES

Already subthreshold values affect the bee colony:

- Rapid decrease in condition and age of workers
- **Reduce orientation, visual, olfactory and gustatory sensitivity**
- **Reduce ability to learn** - to search for pasture - „to dance“
- Reduce motoric skills: flight, walking, feeding of brood, sperm movement
- Prolong larval development of workers (up to the level of drones)
- Reduce defense + immunity: increase of infections and viruses
- Increase robbing, transmission of mites -> collapse of the bee colony

# NEONIKOTINOIDS APPROVED IN EU

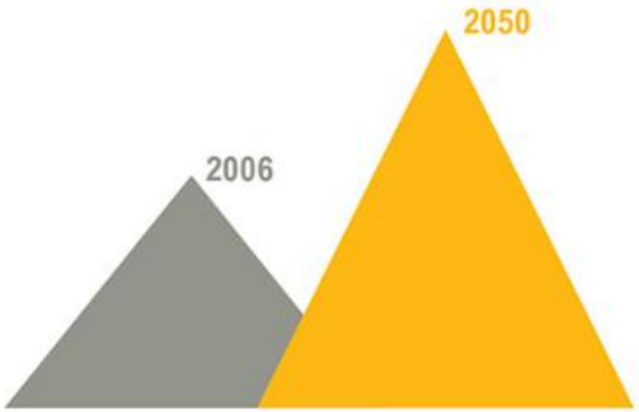
- **ACETAMIPRID** – sprays – Carnadine, Roslix - **rapeseed beetle, herbivore, rapeseed borer, rootworm, potato bandworm)**
- a **IMIDACLOPRID (aphids, whiteflies, thrips and cicadas)**
- Acetamiprid – approved for use until Feb 28th, 2033, used also by gardeners (Mospilan)
- Imidakloprid – in greenhouses and households, e.g. against ants (Vertimec)

Clothianidin - banned for outdoor use, allowed for barns, stables, piggeries (Kolba)

Thiamethoxam - banned for outdoor use

Thiacloprid - banned for outdoor useAcetamiprid is also banned in France (since 2018)

# What should we expect?

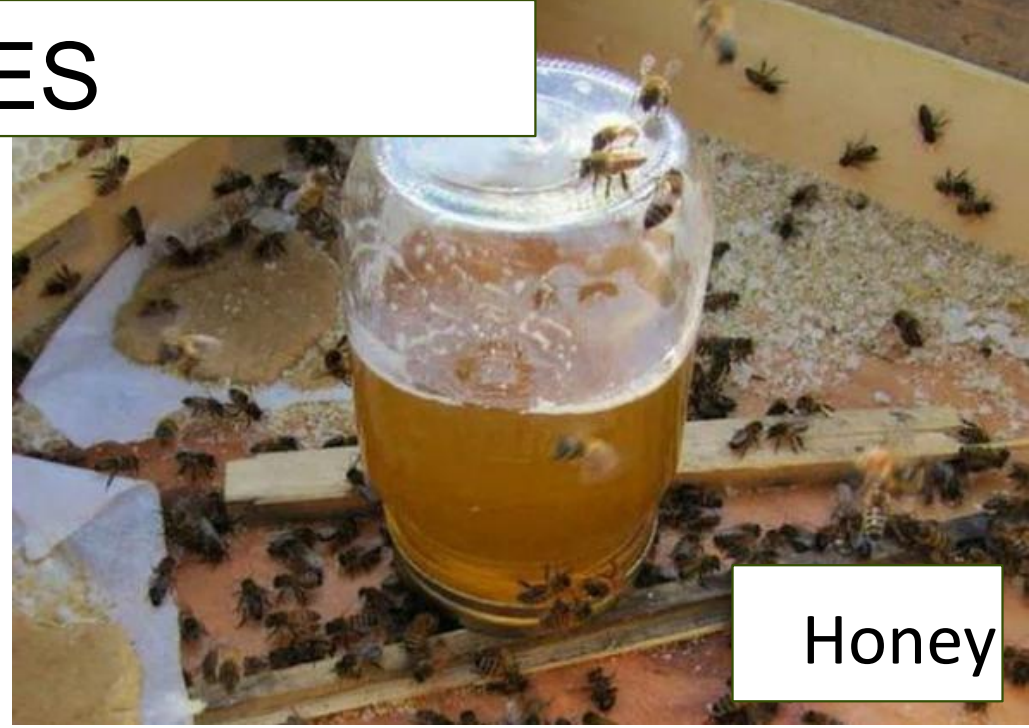



**69%**

**Food needs for 9.2 billion people by 2050**


# FEEDING OF BEES

Sugar fondant



Honey

Pollen and sugar fondant

Pollen

# PROTEIN FEEDS

**FEEDING WITH POLLEN FONDANT**

Dried pollen:500g

Drinking water:200ml

**FEEDING WITH GROUNDED POLLEN**

**FEEDING WITH YEAST**

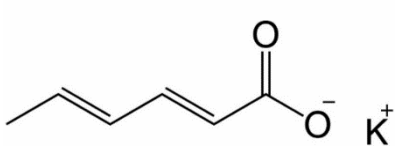
Dough: 10-20% yeast is mixed with syrup and powdered sugar

# COMMERCIAL FEEDS FOR HONEYBEES

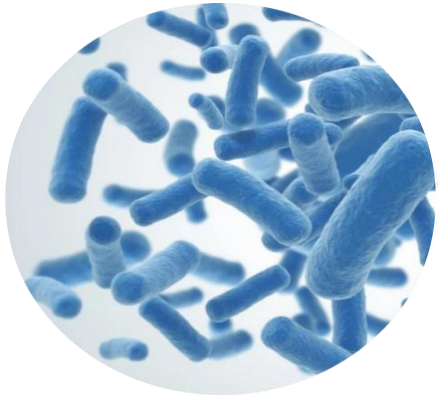
Feed additives are added to maintain or improve the safety, freshness, taste, texture, or appearance of feed.

**E.g.:**

| **Conservants (E202) etc.** | **Aromas** | **Vitamins, amino acids, minerals…** | **Lactobacils etc.** |
|---|---|---|---|







**Cathegory:**

| **Technological additives** | **Senzoric additives** | **Nutritional additives** | **Zootechnical additives** |
|---|---|---|---|

# Plant extracts in commercial feeds


Nozevit®, Nozevit +®, VitaFeed Gold®, ApiHerb®, HiveAlive® (extr. from algae), etc.

# Plant extracts increasing imunity of bees

- **resveratrol – from plants and herbs, grape skins, black berries (Maistrello et al. 2008; Costa et al. 2010);**
- **– thymol – from thyme essential oil (Maistrello et al. 2008; Costa et al. 2010);**
- **- oak bark, sage and wormwood (Glavinič et al. 2024).**

# Threats of the beekeeping: pesticides in honey and honey import

EURL Residue Findings Report on a Pilot Monitoring Study in Honey

*„1. Celkové množstvo včelieho medu dovezené do SR (med určený pre vnútorný trh) v II. polroku r. 2024 a v I. polroku r. 2025“*

| 2. polrok 2024 | | 1.polrok 2025 | |
|---|---|---|---|
| HODNOTA (EUR) | HMOTNOSŤ (KG) | HODNOTA (EUR) | HMOTNOSŤ (KG) |
| 7 160 164 | 2 476 779 | 2 560 762 | 1 026 507 |

## Import to Slovakia

| | 2. polrok 2024 | | 1.polrok 2025 | |
|---|---|---|---|---|
| Krajina pôvodu | HODNOTA (EUR) | HMOTNOSŤ (KG) | HODNOTA (EUR) | HMOTNOSŤ (KG) |
| Česko | 2 366 527 | 1 079 275 | 345 706 | 111 324 |
| Moldavská republika | 805 427 | 362 854 | 880 871 | 406 340 |
| Ruská federácia | 548 231 | 420 000 | 360 796 | 260 000 |
| Španielsko | 171 765 | 43 243 | 274 508 | 78 232 |
| Rumunsko | 85 128 | 27 230 | 164 170 | 48 562 |
| Poľsko | 63 432 | 6 483 | 42 699 | 2 224 |
| Maďarsko | 63 753 | 7 936 | 37 501 | 6 865 |
| Čína | 178 | 11 | 108 | 4 |

## Export from Slovakia

| | 2. polrok 2024 | | 1.polrok 2025 | |
|---|---|---|---|---|
| Krajina pôvodu | HODNOTA (EUR) | HMOTNOSŤ (KG) | HODNOTA (EUR) | HMOTNOSŤ (KG) |
| **Slovensko** | 174 416 | 41 557 | 1 939 251 | 608 128 |
| **iné** | 2 858 575 | 856 601 | 190 649 | 29 517 |
| **Celkový súčet** | 3 032 991 | 898 158 | 2 129 900 | 637 645 |

# HOW to stop Starving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Thank you for real actions to save the bees!