Foster for beekeeping bridges through innovative and participate training

# “Bee health field tool”

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beeB
beekeeping bridges

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# BEE HEALTH FIELD TOOL

The **Bee health field tool** (related with the most important and actual technical constraint in beekeeping are the technical features related with bee diseases and nutrition) was developed in a format that can be easily used in the field by all beekeepers, independent of their background, using an innovative learning strategy - gamification – that provides an effective, informal learning environment, and helps learners practice real-life situations and challenges in a safe environment.

The Bee health field is part of the contents of the MOOC course curriculum allowing to achieve a training skill and specialization in bee health and nutrition. The expected impact is related with the possibility of enabling beekeepers to acquire the best and innovative beekeeping techniques and skills in this area of the production itinerary. This knowledge and skills are essential for the professionalization of beekeepers as the survival of the bees is compromised by the pressures related with these issues. Furthermore, the Bee health is the main factor for improving the beekeeping performance and for increasing the production and quality of the bee products in order to achieve adequate economic profits. It is also expected to have an impact in the active learning sector, by the development and use of gamifications as training tool.

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# Wintering the bees, start of new season

| WINTER | What do I see? | What to do? | Go to slide |
|---|---|---|---|
| Snow?! | Hives are covered with snow | Do not do anything | 8 |
| | | If weather is getting wormer, make sure that bees can perform their cleaning flight | 8 |
| Food resources | No food | Check the hive weight/capped honey cells | 9 |
| | | Add sugar candy or add food frames | 11 |
| | Plenty of food (only in spring in start of colony growth) | Sometimes removing some frames to give them to a hungry colony if necessary, otherwise don't disturb the colony | 13 |
| | Mold on frames | Use net-bottoms, remove plastic from the top in winter | 33 |
| Winter cluster | Big cluster | Be happy | 13 |
| | Small cluster | Place the frames with cluster on the hive edge and add some insulation | 12 |
| Hive cleaning | Bottom | Replace/clean the bottom of the hive in spring | 12 |
| | Dirt spots in front of the hive, on hive, on frames, on snow | Take a bee sample to check for the Nosema. Replace dirty frames. | 10 |

# Hive strength, summer

| SUMMER | What do I see? | What to do? | Go to slide |
|---|---|---|---|
| Strong hive | Hive is full of bees, (all frames covered with bees, brood on outermost frames too) | Add extra honey super | 13, 16 |
| | | Make some extra room for colony | 16 |
| | | Split the colony (make nucleus colony) | 15 |
| | | Check swarming signs, catch the swarm | 23 |
| Weak colony | Many frames empty, new frames untouched, colony is not growing | Add sealed brood frame(s) | 17 |
| | | Check the presence and quality of queen | 17 |
| | | Check the presence and age of brood | 17 |
| | | Replace the queen if necessary | 22 |
| Making new colony | You have some extra hive equipment | Split the colonies and add new queen to queenless colony | 15 |
| | You have strong colonies | Make nucleus colonies. | 15 |

# Colony health

| | What do I see | What to do | Go to slide |
|---|---|---|---|
| Damage | A mouse in the hive/ ruined frames | Catch the mouse | 30 |
| | | Close hive entrance with metal net or special gate | 30 |
| | Holes in the hive (birds, marten) | Catch the marten. Surround the hive with metal mesh | 35 |
| | Bear damage | Install electric fence. Contact local hunter. | 34 |
| | Some wool on frames (wax moth) | Destroy/melt the frames | 37 |
| disease | Dirty hive | Clean/replace the frames/hive equipment | 10 |
| | Bees with crippled wings | Treat Varroa! If its not too late… | 29 |
| | Strange looking brood, bad smell | Check for American or European foulbrood | 39 |
| parasites | Red spots on bees/mites on hive bottom | Perform Varroa treatment | 21 |
| | Wasps | Place wasp traps/ narrow the hive entrance | 31 |
| | Beetles in hive/meshy frames/nasty smell | Destroy the whole hive | 32 |
| | Varroa infestation in honey bee colony | Treat varroa | 26, 27, 28 |

# Frame management

| Time? | What do I see? | What to do? | Go to slide |
|---|---|---|---|
| Early spring | Much of drone brood on frame? | Check queen quality. The queen fertilization rate may be decreased. Replace the queen if necessary. | 18 |
| Any time | | The colony may be queenless and worker bees have started laying eggs. New mated queen is needed! | 18 |
| Honey harvest | Ripen or too fresh honey | Don't harvest honey too early. At least 1/3 of honey frame should be sealed. | 24 |
| | | Before harvesting, shake the honey frame horizontally – if nectar drops out, the honey is unripe | 24 |
| | | Use refractometer to measre honey moisture content %. | 24 |
| Spring/fall | Dark wax in frames | Dark frames should be melted and recycled (new wax sheets). | 29, 36 |

# Other issues

| Time? | What do I see? | What to do? | Go to slide |
|---|---|---|---|
| Spring | Colony is not developing well in spring | Add some extra protein patties | 14 |
| During the season | Colony is queenless | Raise queens by your own | 19 |
| Summer | Small young queen | Do nothing. The young virgin queen hasn´t mated yet, just wait | 20 |
| During the season | There is thousands of bees in colony and finding a queen is complicated | Mark your queen according to year, using special marking colours | 21 |
| Summer | I saw big bee swarm hanging on my tree | The bee colony has swarmed. Try to catch the swarm | 23 |
| Summer | The honey is harvested, how to feed your bees? | Give your bees sugar syrup in late summer | 25 |
| Spring | I see mummies | Keep hygienic bees; high hygiene in apiary | 38 |
| Season | Yellow and stinky larvae | Check for European or American foulbrood | 39 |
| Season | “Sacky” brood in your hive | Check for food, re-queen if necessary, high hygiene in apiary | 40 |

# Overwintering the colonies

- Depends on the climate
- Hives can be in the snow, no extra insulation is needed
  - Let them be
  - You may check the sound
- In warmer climate feed the colonies if needed

Photo: Risto Raimets

# Hungry colony

- Before spring starts it is crucial to check whether bees have sufficient food supplies
  - No capped cells
  - Hive is light
- In this picture the colony suffers starvation
- Extra food (candy patties or extra honey frames) must be inserted

Photo: Risto Raimets

# Nosema

- Nosematosis is a fungal diseases that may cause severe damage to bee colony
- Two species: *Nosema apis* and *Nosema ceranae*
- *N. apis* clinical symptom is diarrhea
- No clinical symptoms for *N. ceranae*, except weak and perishing colony
- **Take a sample of forager bees (20 bees is enough) and send to the laboratory for analysis**
- How to treat?
  - High hygienic behavior in apiary – **do not** use same hive equipment when working in your other apiaries, to avoid the spread of disease
  - Re-queen colonies
  - Replace with clean frames

Photo: Sigmar Naudi

# Extra feeding in late winter/early spring

- Cut approx. 20x20 cm hole into plastic covering the patty
- Place the sugar candy patty on
the cluster, with the hole towards frames
- After a week or two open the hive for food inspection

Photo: Sigmar Naudi

# Small colony

- In spring, it is vital to assess colony strength, Remove hive roof and count how many frame-streets bees are covering
- Then lift the bottom box and assess how many bees you can see ( as shown in picture)
- In this picture the colony is small and no extra boxes are needed
- In case of rapid colony growth  make them extra space

Photo: Sigmar Naudi

# Strong colony

- After wintering the strong colony covers more than half of the frames
- Assess the food stores! Big colonies may get hungry easily
- If the colony is full of food frames, replace them with empty frames to give queen room for ovipositioning

Photo: Reet Karise

# Protein feeding

- Extra protein (pollen patties) can be feed to bees
- The best time is:
  - In early spring, to promote colony development
  - Late summer – preparing bees for overwintering
- Protein powder is mixed with sugar syrup and the patty is formed
- Small piece of pattie is visible on picture (marked with red circle)

Photo: Sigmar Naudi

# How to increase your apiary?

- Make nucleus colonies (take 2 brood frame with bees +1 food frame)
- Split the colonies
- Keep the old queen in original hive and introduce a new queen the nucleus colony

Normal-sized colonies and nucleus colonies

Photo: Sigmar Naudi

Photo: Risto Raimets

# Comparing colony development

- In case most colonies are normal-sized “towers” and some are not
- There is obviously something wrong with colony “75”
- You should re-queen this colony

Colonies with different development

Photo: Risto Raimets

# Queen quality

- It is essential to monitor honey bee queen quality
- Empty cells are normal, bees use these when ventilating or heating the brood
- Good queen = bigger and healthier colony
- Bigger honey yield

Photo: Risto Raimets

# A drone-laying queen – not good

- Unfertilized eggs are layed into worker brood cells
- Normal drone brood should be on the edges of the frame
- Observe the queen behaviour, consider replacement

Photo: Sigmar Naudi

# Queenless colony

- Absence of queen: no young brood, bees get angry easily
- If the colony becomes queenless, then it is essential to provide new queen as soon as possible
  - One option is to breed your own queens, using grafting
  - Grafting = 1-3 days old worker larvae must be transferred into (artificial) queen cell cups, which are inserted into cell builder colony. Approximately after 12 days the queens will emerge (depends on the age of grafted larvae)
  - NB! Hatching in incubator is safer, otherwise first emerging queen will kill the other pupae

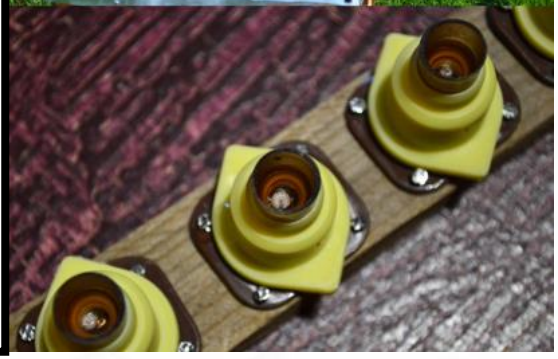

Photo: Sigmar Naudi

# Young virgin queen

- It is not easy to recognize young virgin queen in honeybee colony
- Lighter virgin queens are almost as same size as worker bees
- Nevertheless, pay attention to queen colours!
- Keep in mind that virgin queen is able to pass through the queen excluder in your hive!

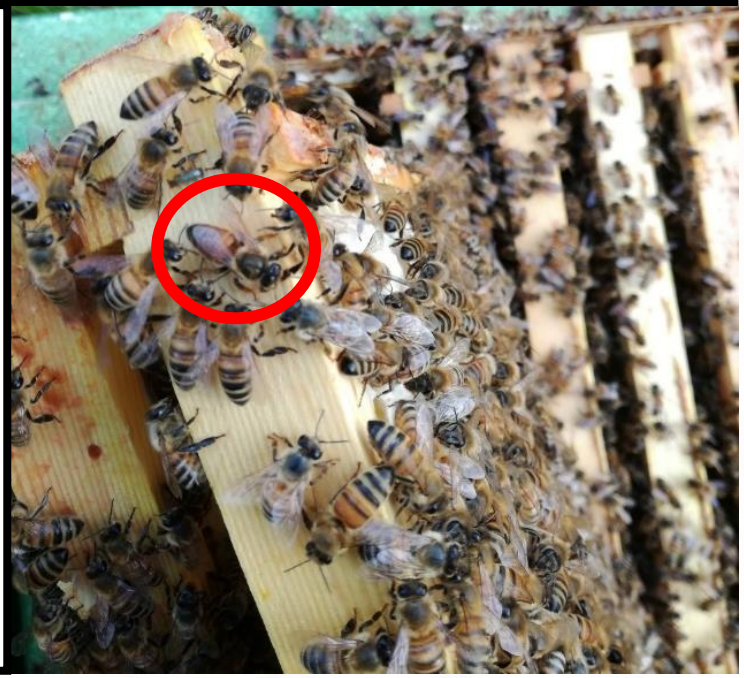

Photo: Reet Karise

# How to find the queen bee from the colony?

- No matter how skilled beekeeper is, it is still sometimes hard to find a queen from the colony
- To make queen distinction more easy, it is important to mark your queen, using special colours

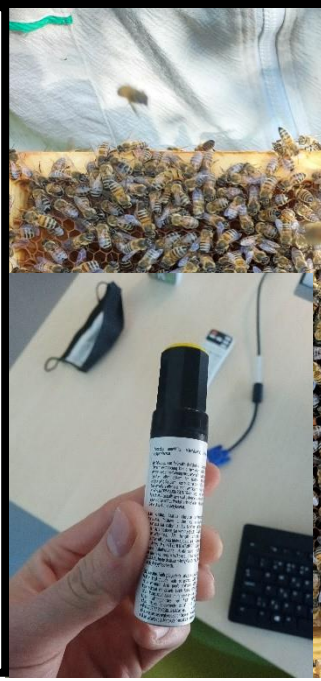

Photo: Risto Raimets

Photo: Reet Karise

# Introducing new queen

- There are multiple ways to re-queen colony
- One option is to remove old queen and after 24 h insert a new queen
- NB! Pay attention that queenless colony will build new queen cells
- It is vital to remove all queen cells before introducing new queen!
- Queen cage and insertion into colony is described on pictures – don't forget to break off the lid from the sugar portion

Photo: Sigmar Naudi

# Swarming

- Bees flying out of the hive and gather on nearby tree or bush
- Try to catch them
  - You need a box with tight lid
  - Few empty of new frames
  - Equipment to reach the swarm (they may be high trees)
- Shake the branch or use shovel
- Cover the box, let the bees crawl into the box
- Keep the swarm in cool place in the box for 24 hours, to let them calm down. Check, whether the queen has started laying eggs and introduce your swarm into new hive

When the queen is in the box, the rest of bees will gom after her into the box

Catch the swarm into a box, with few empty frames

Photo: Reet Karise

# Unripe honey

- How do recognize when honey is ready for harvest?
- Normally bees seal the ripe honeycombs with wax
- In this picture, the honey is definitely unripe
- If you doubt, shake the frame in horizontal position and unripe honey (nectar) will drop out of combs

Photo: Risto Raimets

# Feeding in late summer

- After honey harvest it is vital to feed your bees
- For feeding, sugar syrup (3:2 solution) and feeder is needed
- Make sure that there is enough space for syrup in combs
- Perform feeding with intervals (normally after 7 days)
- The amount of syrup needed depends on your country climate etc

Installing a sugar syrup feeder

Feeding

Photo: Sigmar Naudi

# Varroa mites in your apiary

- Varroa mites are spread almost all over the world
- It is vital to treat against varroa to keep your colonies alive
- Oxalic acid dribble is performed in late autumn when there is less or no brood present in colony (see in picture)

Photo: Sigmar Naudi

# Treating varroa (II)

- Another organic treatment for varroa is formic acid
- Household cloth/sponge is impregnated with 65% formic acid solution and put into sealed plastic bag
- When installing it into hive, the plastic bag stripe is cut and the bag is installed on the frames
- Formic acid vapor spreads within the hive and varroa mites are killed
- NB! Use proper respirator, when working!

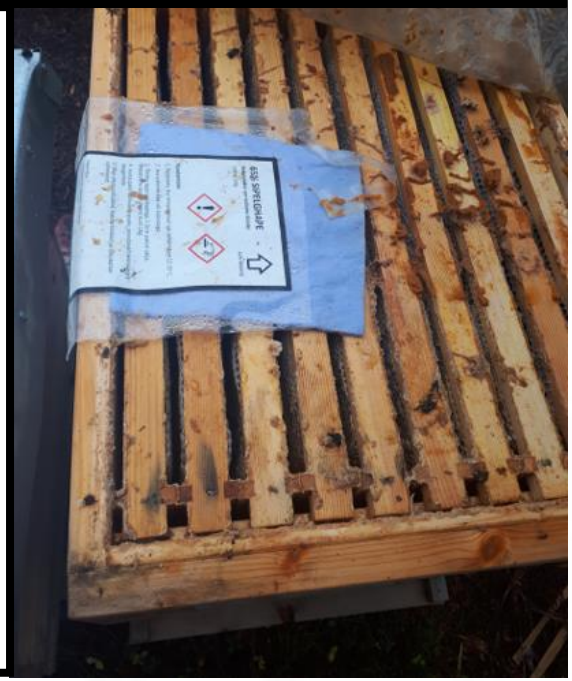

Photo: Sigmar Naudi

# Count the mites!

- Treatment without the reason is not good to bees
- Count after every treatment, how many mites fall during 24 h
- Make the alcohol wash measurement

Photo: Reet Karise

# A sign of strong varroa mite damage

- This photo was taken in spring 2022
- There were no bees left in the hive
- The hive was full of food (syrup frames)
- There were some sealed brood frames
- Take a closer look – small holes in brood cappings indicate heavy varroa infestation

Photo: Risto Raimets

Photo: Bjorn Dahle

# Mouse proofing-fence

- It is vital to add mouse/bird proofing-fence before winter
- Some beekeepers cover their whole hives with mesh
- Some beekeepers just cover the entrance with metal mesh


Photo: Sigmar Naudi

# Asian hornet

- To avoid the Asian hornet attack, use special equipment
- Electric fence to avoid hornets capturing forager bees on hive entrance

Photo: Cristina Amaro da Costa

# Small hive beetle

- Adults: black beetles, 5-6 mm in length
- Larvae: up to 1 cm in length, pearly white crawling worms
- Small hive beetle damages combs. In heavy infestation, the entire hive looks like a nasty mess.
- **Contact authorities!** This is a pest, which is under strict control measures.

Photo: Maria José Valério (INIAV)

# Avoiding excessive moisture

- A good ventilation is essential for good colony overwintering
- Use hive bottom boards with ventilation holes (covered with metal mesh). NB! The ventilation holes must be big enough (like in picture)
- Some beekeepers remove plastic from the top of the colony (it prevents water condensation)

Photo: Sigmar Naudi

# Bear damage

- Bears may cause severe damage in apiary
- There are some options to prevent bear damage
  1) Choose your apiary location wise
  2) Use electric bear fences
  3) Use repellents etc
  4) Contact local hunters

Photo: Risto Raimets

# Bird damage

- In winter, when bees are clustered and they are not very active, the honeybee colony is pretty vulnerable.
- The birds like woodpecker or Great tit may damage the hive.
- In this picture, the woodpecker damage is pictured
- In autumn, cover hive with metal mesh
- Metal mesh protects against other animals (marten, mice etc)


Photo: Risto Raimets

# Wax recycling

- Old and dark combs should be removed from hives
- After overwintering it is good practice to lift old and dark nest combs into honey supers and let the bees fill them with honey
- After honey harvest the dark combs will be melted and sent to factory for new wax sheets
- NB! The red circles are just marked bees with varroa

Old brood combs that need to be removed from hive

Photos: Risto Raimets ;Reet Karise

# Wax moth

- Wax moth larvae has an unusual ability to digest and decompose honeybee wax (carbohydrates assimilation)
- Larvae knits strong white cocoon (as shown in picture)
- If beekeeper discovers such frame (usually among stored frames) it should be destroyed/melted! The best way to avoid wax moth is to use acetic acid (spinned frames are stored in cold room and the acetic acid is poured on boxes/supers)

Photo: Reet Karise

# Chalkbrood

- Caused by fungus *Ascosphaera apis*
- It rarely kills infected colonies
- Bee larvae will die after sealed
- Typical sign of disease: “mummies”
- How to manage?
  - Good colony management (ventilation etc)
  - Young and healthy queens
  - Hygienic bees

Photo: Bjorn Dahle

# European f foulbrood (EFB)

# American foulbrood (AFB)

- A brood disease, caused by the bacterium *Melissococcus plutonius* (EFB) and *Paenibacillus larvae* (AFB)
- Infects larvae of all ages
- Infected larvae will die
- Clinical signs: dead larvae, larvae turns into yellow or brown, the larvae is sticky and “molten” in cell
- How to treat:
  - At first, take samples and analyse them!
  - Good colony management practices
  - Keep healthy and young queen
  - Keep hygienic bees
  - High hygienic behavior in your apiary
  - Destroy the colonies, if needed

Photo: Bjorn Dahle

# Sacbrood

- Caused by virus in the Iflavirus genus
- Mostly affects worker larvae
- Can be detrimental to colony if combined other stress factors (shortage of pollen or nectar)
- Normally, honeybees can manage this virus by removing infected larvae
- Re-queening is one option to fight disease
- Also beekeeper hygienic behavior is vital
  - Removing 3-4 years old brood combs is essential

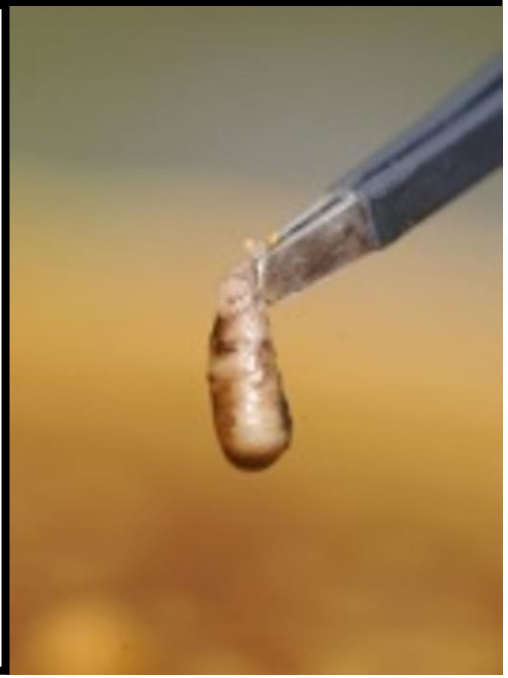

Photo: Bjorn Dahle

# Foster for beekeeping bridges through innovative and participate training

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