Beegnostic app User manual

Made for Beegnostic v1.31, Beegnostic Demo v1.60 versions

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Beegnostic

"Beegnostic" contains of smartphone/tablet, app "Beegnostic" and external microphone (more about it in below chapter "Equipment options for Beegnostic app").

App "Beegnostic" determines honeybees Apis Mellifera colonies behaviour by their creating sound by using microphone.

The app measures these five parameters:

- Prediction of swarming in bee colony.
- Aggression of bee colony.
- Efficiency of bee colony.
- Ventilation of beehive.
- Queen-loss.

"Beegnostic" Demo version measure only one parameter "Prediction of swarming in bee colony". If you want to measure all five parameters buy full version of "Beegnostic" app.

Equipment options for Beegnostic app

1. **Optimal**. Use external omnidirectional lavalier microphone with these parameters:
   - Sensitivity more than -45dB. (best -30dB);
   - Frequency range from 100Hz to 3000Hz (ideal range from 50Hz to 16000Hz or more);
   - Microphone diameter smaller than 10 mm (so that it can be easily inserted through the entrance of a beehive);
   - Microphone cable length longer than 1.5 m;
   - Microphone need to have TRRS output jack (four ring contacts). If microphone output jack has two or three rings contact, you need to use adapter TRS Female to TRRS Male;
     This option – optimal. For addition you need buy microphone which price is 10 – 30 euros and if it has two or three rings contact you need adapter which price is 3 – 9 euros.

Below there is image which show how optimal equipment will look like (fig. 1).

Fig. 1 Optimal variant

2. **Maximum**. Use external omnidirectional lavalier microphone and microphone amplifier. Amplifier minimal frequency range 70Hz to 3000Hz. This option is most expensive, but it can help to get more accurate results because if you need you can amplify sound. In this option microphone sensitivity can be worse.

Below there is image which show how maximum equipment will look like (fig. 2).

Fig. 2 Maximum variant

Needed\Recommended equipment

Microphones:

https://www.amazon.co.uk/Microphone-iGOKU-Omnidirectional-Condenser-Smartphones-3-5mm/dp/B073P7SWHD (iGOKU omnidirectional 3.5mm microphone) - no need to buy adapter.

https://www.amazon.co.uk/Portable-External-Hands-Free-Lavalier-Microphone-color-black/dp/B07TQSWVHR (Lavalier microphone) - need to buy adapter.

https://www.amazon.co.uk/Trust-Lava-USB-Clip-Microphone/dp/B078H9QNT3 (Trust lava clip microphone) - need to buy adapter.

To find more microphone enter "lavalier microphone" to Google search. Do not forget to check microphone specifications so it will let you to diagnose bees more accurate (check optimal equipment above).

Microphone's adapter:

https://www.amazon.com/Kingtop-Adapter-Tablet-Headsets-Version/dp/B01I3A47I4
(Kingtop adapter headsets TRRS)

https://www.ebay.com/itm/184863566742 (Audio headset 3.5mm mic splitter TRRS)

Amplifier:

https://www.ebay.com/itm/275381948582 (Mini microphone amplifier)

https://www.amazon.ca/Microphone-Sound-Amplifier-Audio-Reverberation/dp/B092SN6GPW (A907 microphone amplifier)

Procedure for diagnosing bee colony

1. Download Beegnostic app into your smartphone (https://play.google.com/store/apps/details?id=com.lucma.soft.beegnostic);
2. Simply insert omnidirectional microphone through the entrance of a beehive. Do not forget to clean microphone before inserting to another beehive.

3. Plug microphone in your smartphone or to microphone adapter and then adapter to smartphone.

4. Open Beegnostic app. (The full version of Beegnostic app have external microphone detection icon, check if app detected it, more info in "App window usage descriptions" chapter)
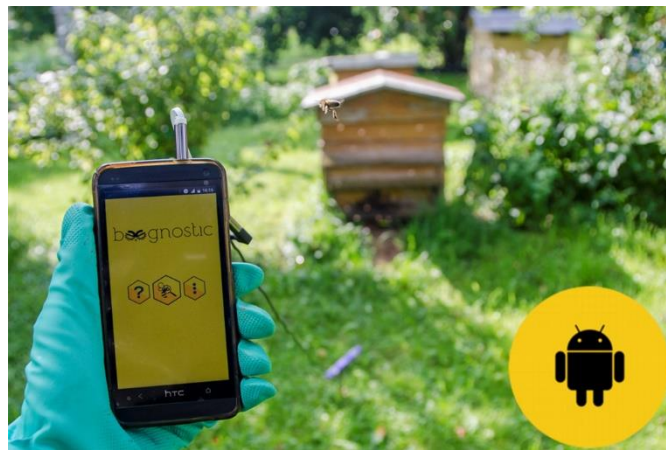
5. Wait about 3 minutes to bees calm down.
6. Press app button "Diagnose".

7. In the screen will pop out message "Testing". Wait about 10 seconds to app test audio quality.
8. If after 10 seconds change message to "Signal quality – bad, please choose a better place or change the gain of the microphone amplifier" you need to change microphone position or amplify sound and again press button "Diagnose";
9. If audio quality is good, the message change to "Recording will start in 5 sec" and after 5 sec will change to "Recording".
10. Wait about 40 seconds. In this time the app will analyse recorded audio and determine bee colony behaviour. In results window you can compare diagnosed results with previous or save them in database to view and analyse later. Check every parameter and decide if bee colony inspection is needed.

When recording it is important to reduce side-effects sound which caused by vehicles, animals humans and natural phenomena (like rain, thunder, etc.). If the environment is very noisy, the accuracy of results can be very low. Then it is recommended to wait until these noises disappear.

If the available microphone does not achieve the required audio signal quality, consider purchasing more sensitivity microphone or microphone amplifier.

The app results are advisory in nature, so we are not responsible of the loss incurred because of the decisions and actions you have taken.

We suggest watching video how to diagnose bee colony using Beegnostic app:

https://www.youtube.com/watch?v=mVG-KIWoPsA

The app "Beegnostic" needs microphone permission to record bees sound and later to analyse it.

Results are automatically saved only locally in internal smartphone/tablet storage and is only used in comparing function to compare different results. Every user can delete results if they want, go to Settings and press Remove compare data.

Results which user save in database are saved locally in internal smartphone/tablet storage and is only used for viewing and analysing results. Every user can delete results from database if they want, go to Settings and press Remove database data.

App usage description

Main window:

Fig. 3 Main window   Fig. 4 Additional window, after pressing [More]

Buttons:

- Diagnose (fig. 3) – app will record bee colony sound and determine their behaviour. (This process takes about ~40 seconds).
- About (fig. 3) – information about app and how to use it.
- More (fig. 3) – shows more additional buttons [Database], [Settings] and [Back].
- Database (fig. 4) – shows database with saved results, apiaries, and beehives.
- Settings (fig. 4) – let change signal quality value, start diagnosing by pressing volume down button, remove compare and database data.
- Back (fig. 4) – goes back to main screen with [Diagnose], [About] and [More] buttons.
- At the bottom left external microphone detection icon (fig. 3). When microphone disconnected the icon is grey color, when connected yellow color. If you see yellow icon but microphone crossed it means that plugged headset does not have microphone. Press on microphone icon for more details.
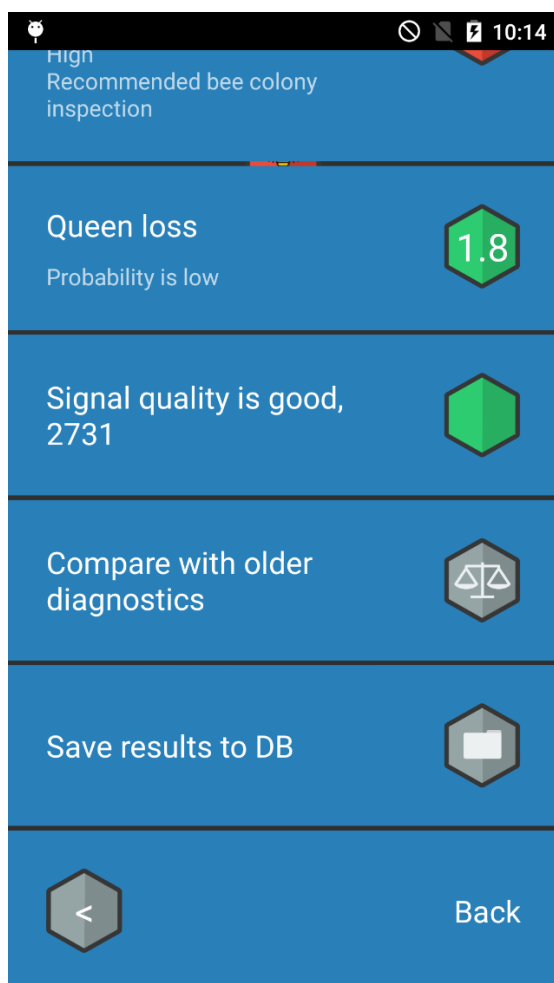
Results window:
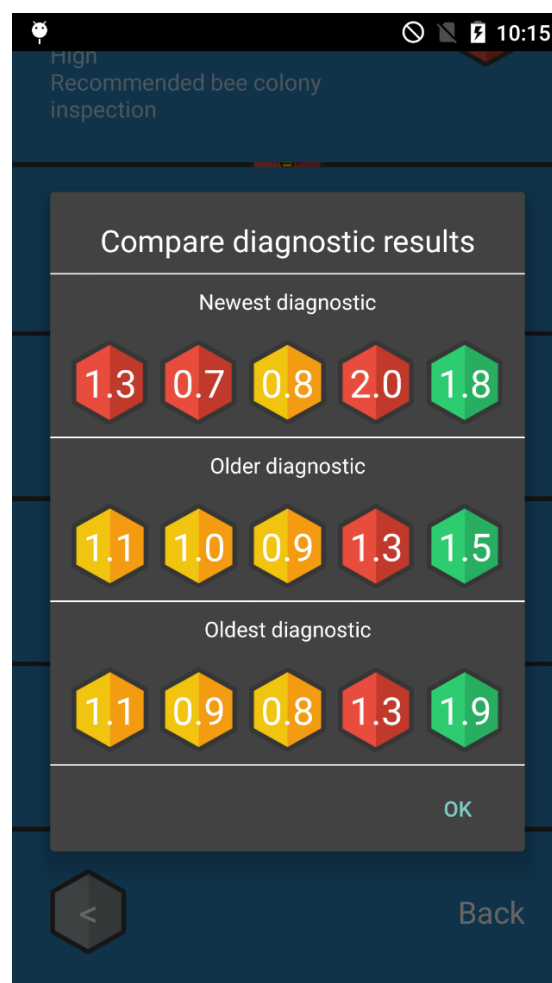

Fig. 5 Results window

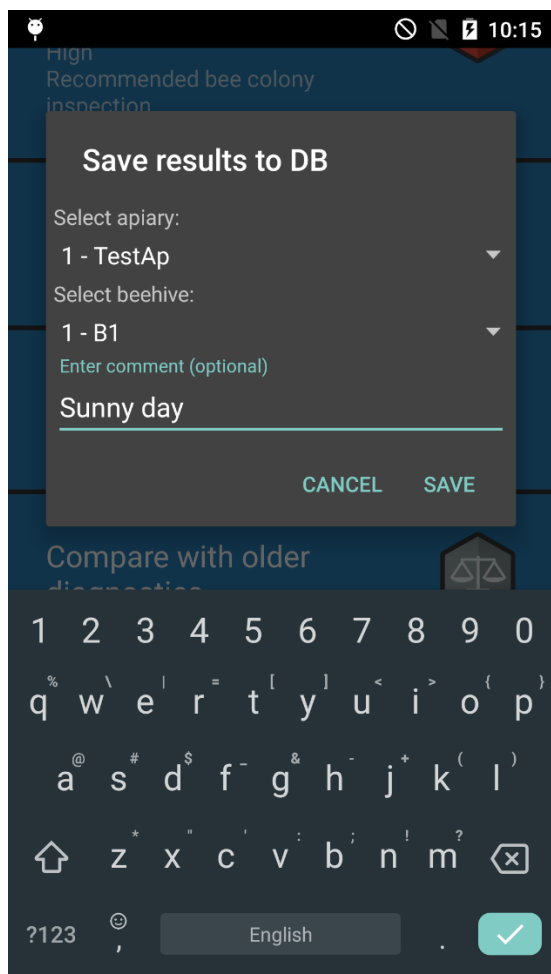Fig. 6 Compare dialog after pressing on Compare results button

Fig. 7 Saving results to database dialog

In results window (fig. 5) you can press on every parameter, and it will show you advice on what to do and what does this parameter means.

Below you will find recorded sound signal quality value, this value shows you how accurate results are.

Pressing on Compare results (fig. 6) shows diagnosed results and previous two results, so you can compare them and analyse.

Pressing on Save results to database (fig. 7) shows dialog in which you need select apiary, beehive and enter comment (optional) and hit Save to save results to database. How to create apiary, beehive and use database it is described in chapter "Saving results in database".

You can sort list by pressing More and Sort by and selecting wanted sorting option (fig. 10b). You can sort result, apiaries and beehives lists.
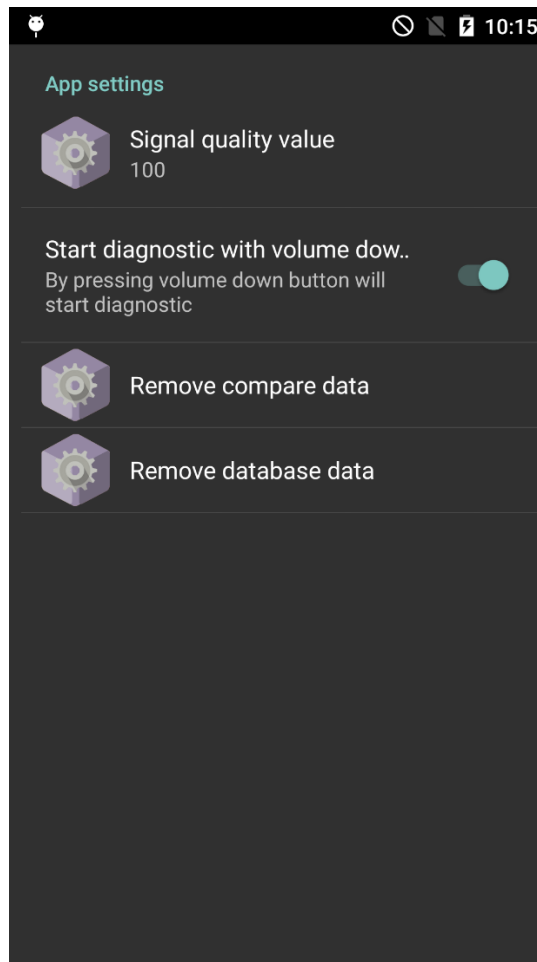
Settings window:

Fig. 8 Settings window

Settings window (fig. 8) contains of four parts.

Signal quality value – default value is 800. By lowering value, you are lowering probability to achieve more accurate diagnostic results. This value set marginal significance in which app will start diagnosing.

Start diagnostic by pressing volume down button. If this value checked, you could start diagnosing in Main window by pressing volume down button.

Delete compare data – by pressing you are deleting compare data from storage.

Delete database data – by pressing you are deleting database data from storage which include saved results, apiaries, and beehives list. After deletion you will not be able to restore.

Saving results in database

The database function is available only in full version of "Beegnostic" app, starting from v1.2.

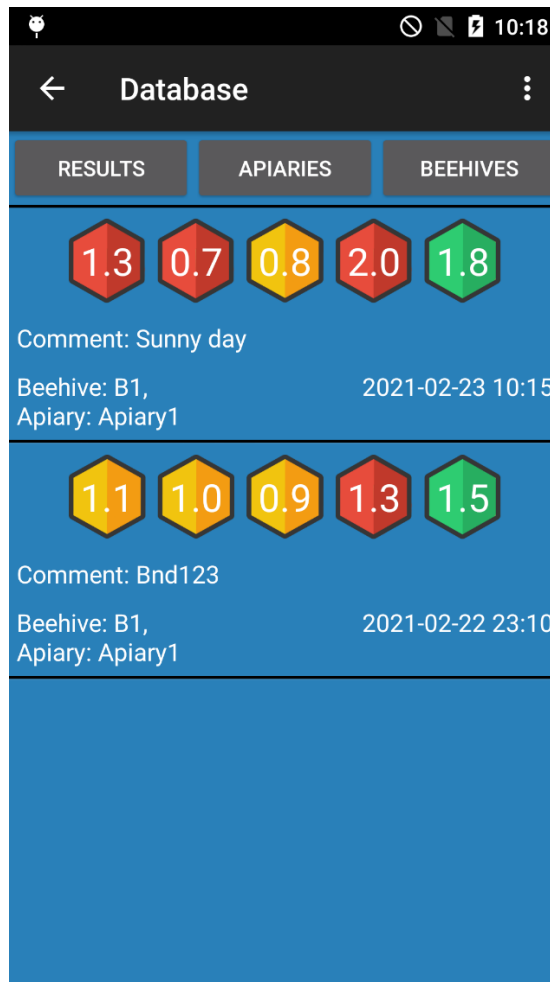To access database window, you need to be in Main window, press [More] and [Database].

Fig. 9 Database saved results window

Fig. 9 shows the main database window, in this window where are displayed saved results. At the top are three main buttons with which help you can access different lists: like saved results, apiaries, and beehives. In this example you can see saved results list and every result five parameters (pressing on them will show detailed info about parameter), comment (user entered), apiary and beehive (user selected) and diagnostic date.

By pressing on item (in this example saved result) will open dialog with ability to edit it, change apiary, beehive, and comment (fig. 10c). By long pressing on item, it will let you delete it. **Important**, if you delete beehive, it will delete all saved results which are associated with deleted beehive. Or if you delete apiary, it will delete all saved results and beehives which are associated with deleted apiary. Moreover, after deletion you will not be able to restore data.

To create apiary, beehive (fig. 10a) you need press [More] (three vertical dots in the right corner of screen) and press Add apiary or Add beehive (fig. 10b), enter needed data and it will be created.
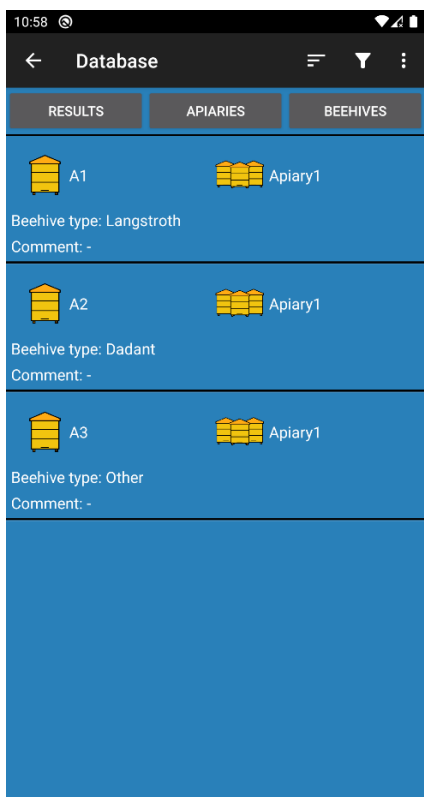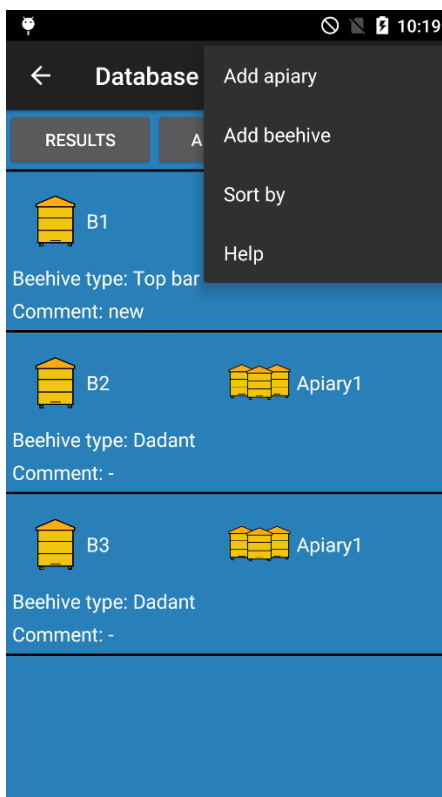

Fig. 10a Database beehive window
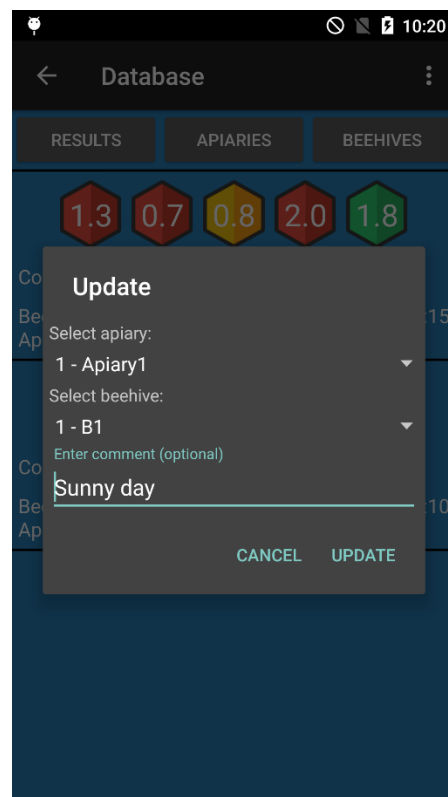
Fig. 10b Pressing [More]

Fig. 10c Item editing

To sort list press on sort button (fig. 10a) and select by what parameters do you want to sort (creation/recording date, hive name, apiary name) (fig. 11a). To sort specific list (results, apiaries, beehives) select wanted list and then press sort button.

To filter list press on filter button (fig. 10a) and select which list you want to filter and select wanted parameters. In beehives list you can filter specific apiary, beehive type beehives, in results list you can filter specific apiary, beehives results (fig. 11b).
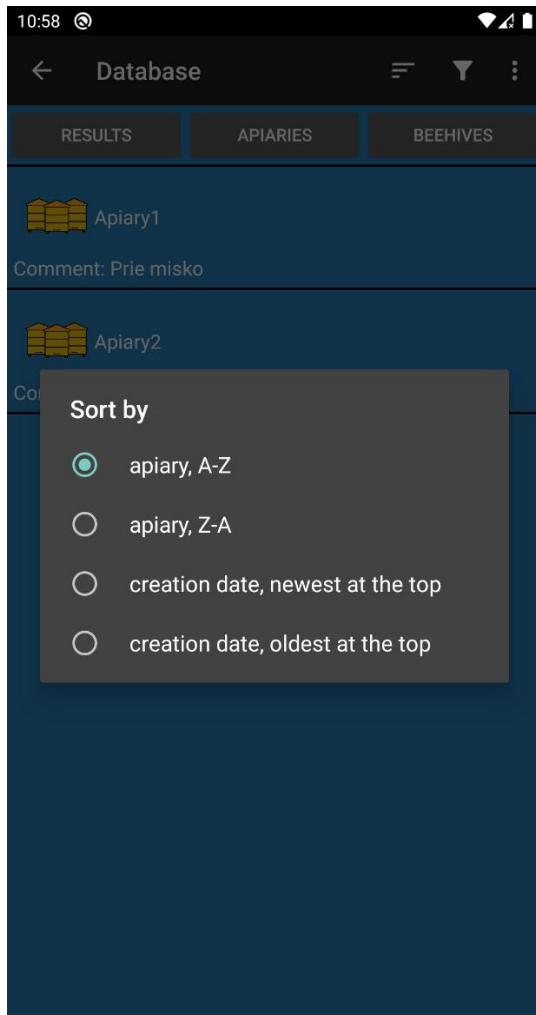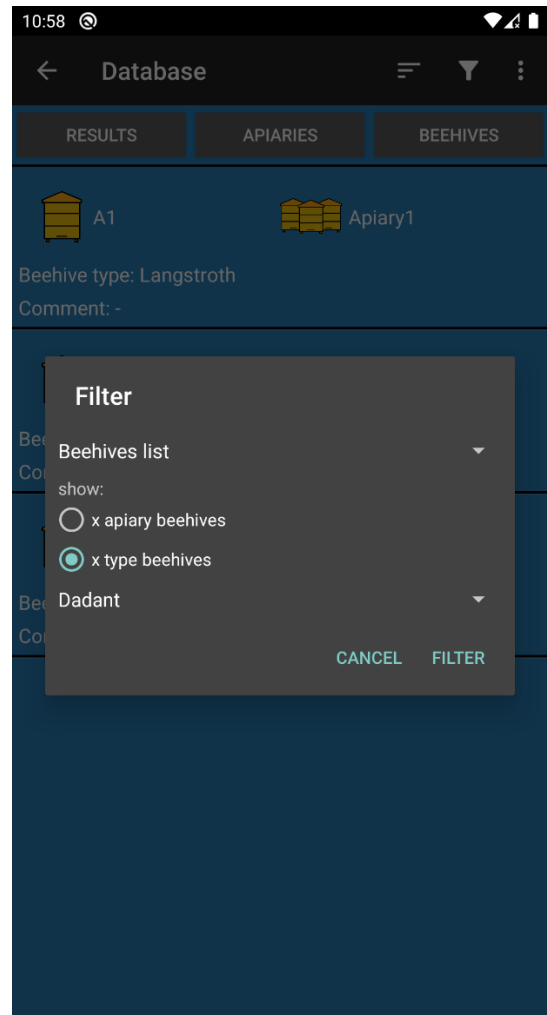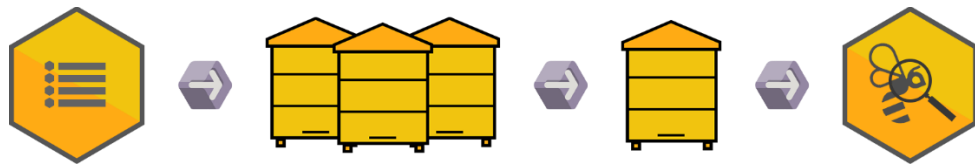
Fig. 11a Sorting

Fig. 11b Filter

Procedure for saving results:

- First you need to access database by pressing [More] and [Database]. In here you need create new apiary by pressing More (three vertical dots) and Add Apiary, name it as you like, for example A1, in the meadow, in the wilderness, etc. and leave comment (optional).
- Then create new beehive same steps but press Add Beehive, select created apiary and enter beehive name (like B1, etc.), select beehive type (Dadant, Langstroth, poly/multibody, top bar, Warre, other) and leave comment (optional).
- After creating beehive, you can start diagnostic and save results to database. In the results window press on Save results to DB and in pop out dialog select apiary, beehive and enter comment (optional) and press "Save".

- If you made mistake by selecting apiary, beehive or entering comment you can edit in Database window by long pressing on result. It will pop out dialog with ability to edit it (fig. 10c).

Beegnostic Telegram bot

Beegnostic Telegram bot is a bot which is available in Telegram app. Bot can help to speed up search for finding needed answers or solve problems.

To start using first you need to have Telegram account, to do so you need to download Telegram app and register. After that you can press here (Beegnostic Telegram bot) or in search bar enter BeegnosticBot. To start conversation press, Start button and follow instructions on screen to select language and choose if you want to get news related to project.

To get command list write /help , in this list are most frequently used commands, answers to frequently asked questions. If you want more detail information you can write /help question, for example /help error 11 or /help locked parameters.

All available information in the Telegram bot is same as in this user manual.

Error code meaning

- Error 10 – error is shown because app do not have access to microphone. To remove error, you need allow app to access microphone. To make it happen you need: 1) open Beegnostic app and there will be pop-out window with asking microphone permission, press "Allow". Or 2) go to Settings -> Apps -> Beegnostic -> Permissions and allow microphone permission.
- Error 11, 12, 13, 14, 15, 16, 17 – internal error. If error is repeating, we suggest to 1) go to Settings, select Beegnostic app and press on "Clear cache", if it does not work 2) try removing and reinstall app (important by removing app all results, information in the database will be deleted). If you cannot resolve this problem, please contact us (email is at the last page of User manual).

Frequently asked questions

1. What smartphone do I need to use app?

    Smartphone/tablet with Android operating system (min version of 4.0) and microphone or ability to connect external microphone.

2. Can I use smartphone internal microphone?

    Yes, you can but it will be not very comfortable to put your smartphone and hold near the entrance of beehive, moreover the results will be not very accurate, so we do not recommend this method.

3. What external microphone do I need to use?

    The external microphone needs to be omnidirectional, frequency range 100Hz – 3000 Hz, sensitivity more than -45dB, if your microphone does not have TRRS jack then you need buy adapter from TRS female to TRRS male, for more information check out text above (Equipment options for Beegnostic app).

4. How to unlock more parameters on Beegnostic Demo app?

    To unlock more parameters, you need to buy full version of Beegnostic:

5. Why do I need microphone amplifier?

    Sometimes the microphone is pointed to the wrong side of hive where is no bees, or bees buzzing is lower than usually, so to get best results it is recommended to use microphone amplifier. More information in the text above "Equipment options for Beegnostic app".

6. How to use database?

    It is described in detail in above chapter "Saving results in database".

Awards

- The Beegnostic project in 2017 was presented in the EUCYS (European Union Contest For Young Scientists), National stage in Lithuania and won the first place (gold medal).

- The project was presented in the EUCYS 2017 Tallinn (Final stage) and won the FoodDrinkEurope bioeconomy prize for the best project in the field of agri food at the European Union Contest for Young Scientists.

Contacts

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Thank you for your time.

Beegnostic team

2022, Lithuania

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