TOXICITY ASSESSMENT OF COUMARIN-1,2,4-TRIAZOLES ON HONEYBEES (*Apis mellifera*)

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INTRODUCTION

Climate change and extensive plant protection agent usage have contributed to pollinator species' rapid decline. The biggest concern and focus is the conservation of honeybee populations (*Apis mellifera*). Recently, the new 1,2,4-triazole coumarin derivatives were synthesized for use as potential plant protection agents by utilizing green chemistry principles [1].

EXPERIMENTAL

To reduce the number of honeybees subjected to *in vivo* testing two toxicity prediction software were used [2,3]. The software that were used, BeeToxAI and SApredictor, implemented the principles of artificial intelligence and structural alert-based systems for a valuable screening assessment of toxicity specifically for honeybees (Fig. 1., Fig. 2.). *In vivo* acute oral toxicity test was conducted by following the OECD guidelines for the testing of chemicals [4]. A total of ten 1,2,4-triazole coumarin derivatives were selected for the experiment based on their possible toxic effect on honeybees, as well as positive and negative control groups, respectively. For an insecticide standard, a commercially available pesticide that contains spinosad as an active agent was used. All compounds were dissolved in a regular sugar syrup feed following OECD guidelines, at a concentration of 15 µg/mL. Every compound was tested in triplicate, with 10 honeybees per repetition. Parameters such as bee mortality (Fig. 3., Fig. 4.) as well as an approximative mass of ingested compound per bee (Fig. 5.) were recorded.

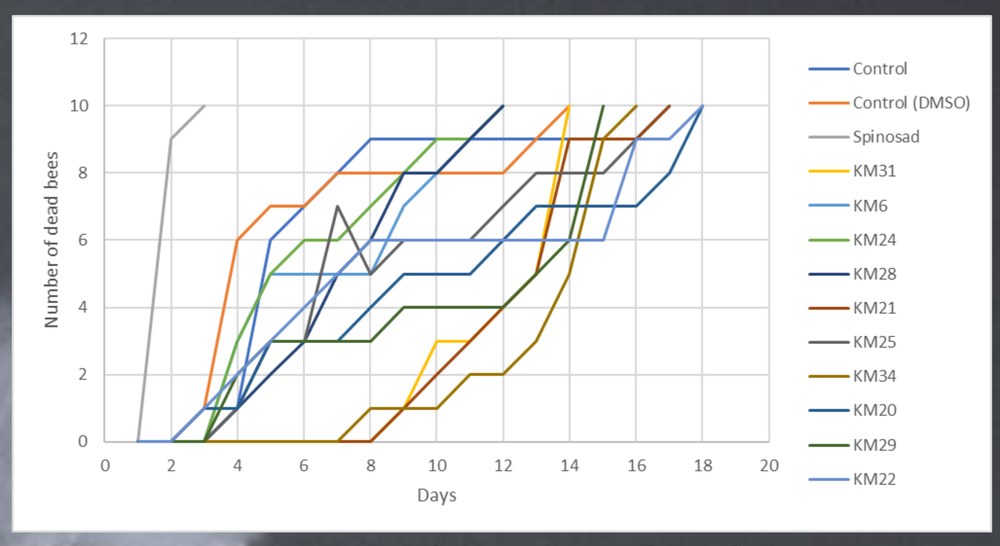

Figure 3. Lowest mortality rates in selected repetitions of selected compounds

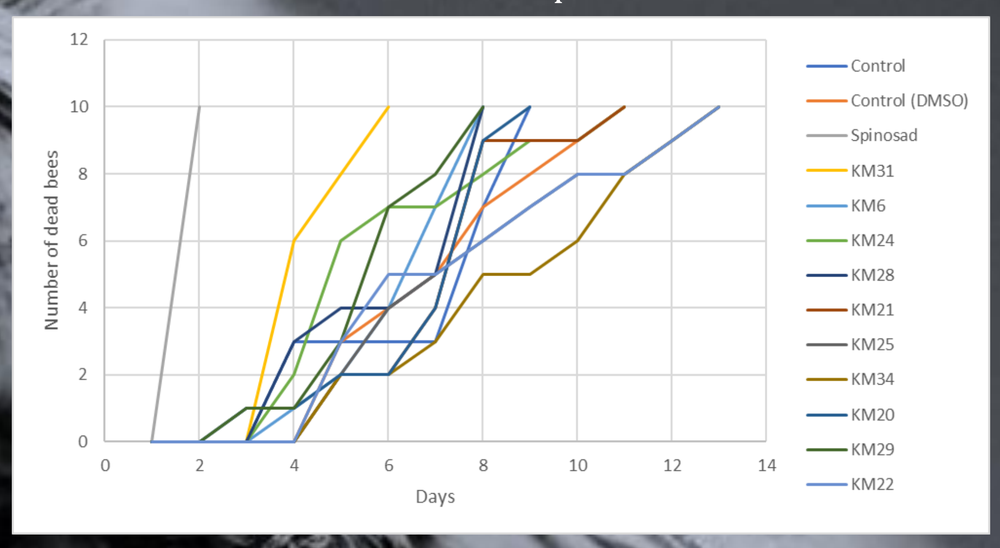

Figure 4. Highest mortality rates in selected repetitions of selected compounds

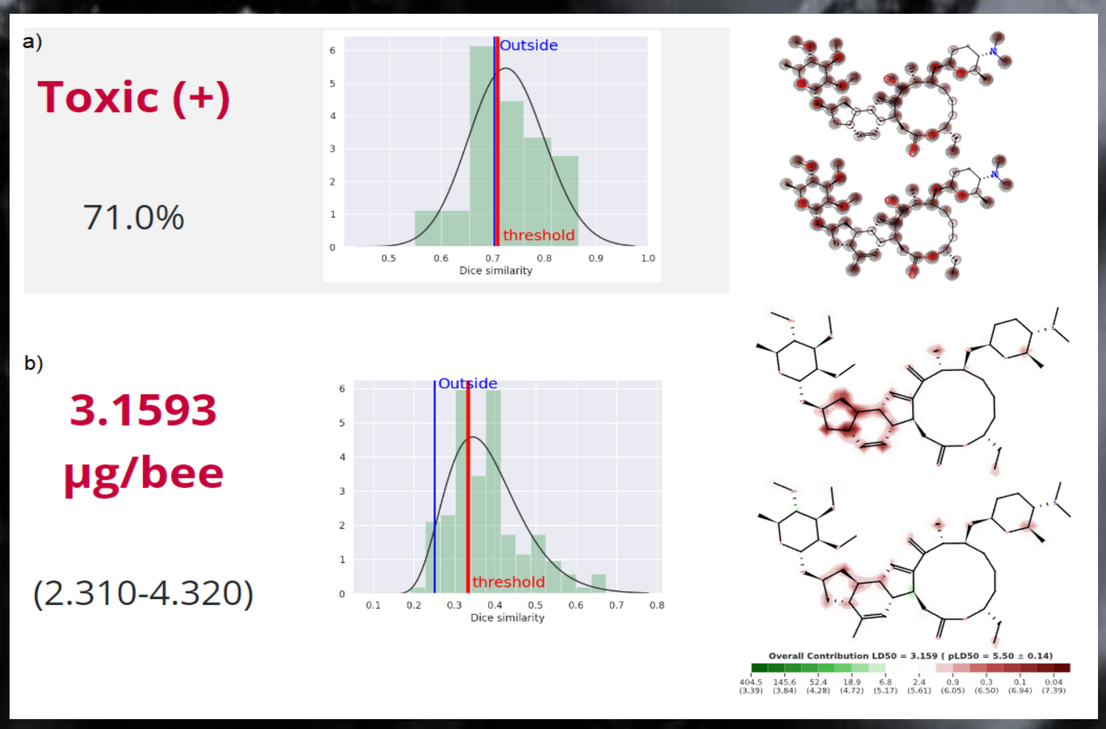

Figure 1. BeeToxAI honeybee toxicity report for spinosad:
a) Acute oral toxicity test
b) Lethal dose (concentration) calculator

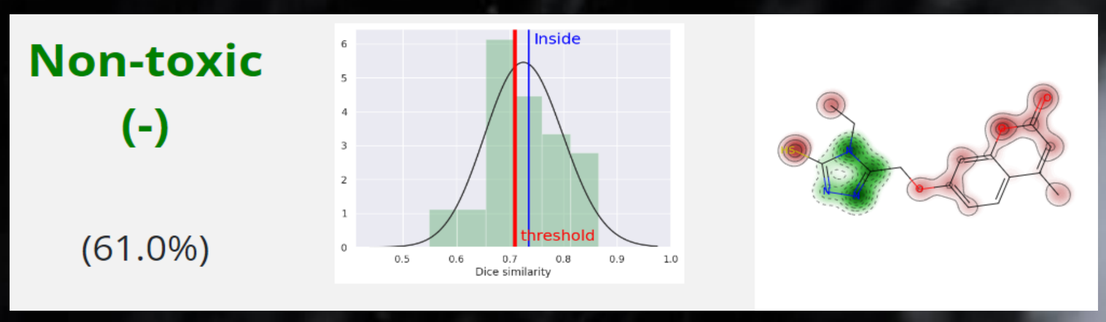

Figure 2. BeeToxAI honeybee toxicity report for compound KM22

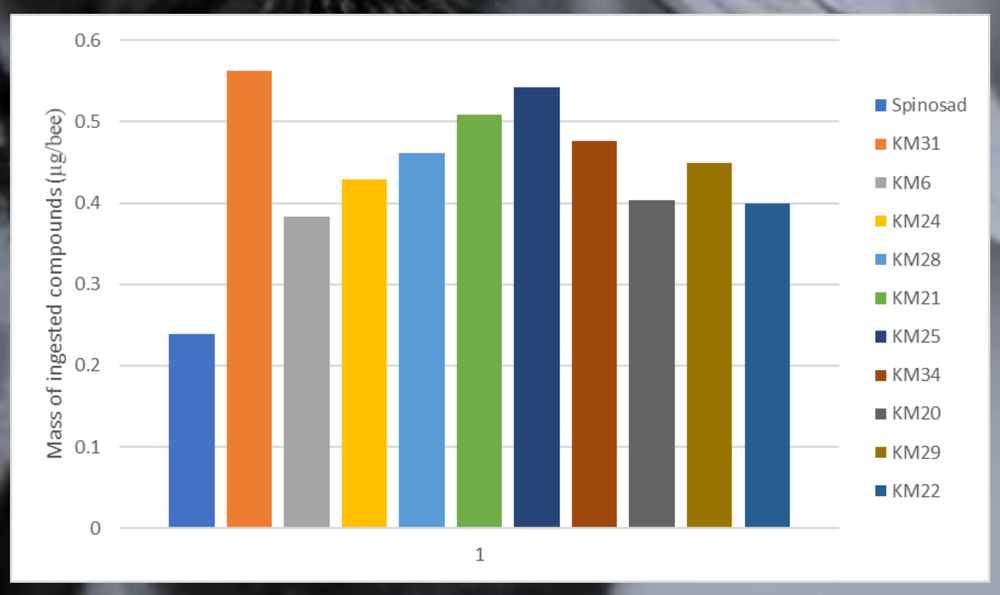

Figure 5. Approximative mass of ingested compound per bee

CONCLUSIONS

- Toxicity prediction software have been proven precise as the majority of tested bees that were fed spinosad died within the 24 h of the experiment
- Compared to the pesticide standard, none of the tested compounds exhibited significantly higher mortality rates, making them potential non-toxic plant protection agents.

REFERENCES

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