

Abstract:

“Development of a demonstrator for web based community-resource on mathematical models in the field of plant protection ”

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Mathematical models on properties and behavior of harmful organisms in the food chain are an increasingly important discipline in agriculture and food industry. As a consequence, there are an increasing number of models published in the scientific literature which might be useful for business operators and risk assessors. However there is a lack of international harmonized standards on model annotation and model formats, which would be necessary to set up efficient tools supporting broad model application and information exchange. Fortunately, there are scientific disciplines where standards for model description are in place for years, specifically in the domain of Systems Biology, so there is the opportunity to transfer and adopt this knowledge into the area of plant protection.

This work aimed at the development of an annotation scheme using domain-specific metadata that can serve as the basis for a web based community-driven model repository. The prototypic implementation of a web-based community resource on plant protection models then also served as a validation of the proposed annotation scheme. This community resource currently contains models on the Aflatoxin-producing fungus *Aspergillus flavus* in maize, as these models have a high relevance to food safety. Specifically models describing biological processes like fungus growth and inactivation, Aflatoxin secretion as well as dose-response and carry-over models are included. Furthermore some phenological models for maize have been included.

The developed annotation scheme is based on the well-established data exchange format SBML, which is broadly applied in the field of Systems Biology. The identified example models were annotated according to the developed scheme and entered into a web-based Google Sheets table, which was then transferred into a web-based model repository*¹.

By implementation of the model repository it could be demonstrated that the proposed annotation scheme is applicable for the description of models on plant pathogens. A broad adoption of such annotation scheme within the scientific domain would thus promote communication and dissemination of mathematical models to interested end users. Further this scheme supports modellers in their attempts to provide quality assured model descriptions. Even software developers will benefit from the proposed standard as this will help to establish harmonized interfaces between different software-tools. It has also been demonstrated that a community-driven model repository can easily be implemented with existing and freely available software resources.

Keywords: plant protection, aspergillus flavus, mathematical models, metadata, plant pathogens, model annotation

*¹<https://sites.google.com/site/test782726372685/>