

# Modelling the impacts of compound climatic events on growth, development and yield parameters of field-grown thermophilic vegetables and oilseed rape in the Decision Support System for the Agrotechnology Transfer – DSSAT

Vera Potopová, Nina Muntean, Rafique Ahasan Chawdhery, Tudor Trifan, Petr Zehnálek, Josef Soukup, Igor Potop, Pavel Zahradníček, Martin Možný

CZU, Faculty of Agrobiological Sciences, Department of agroecology and crop production

Central Institute for Supervising and Testing in Agriculture

Global Change Research Institute CAS

Category: B (Certified methodology)

Certification methodology is based on linking growth models, regional climate models with experimental fields as tools for predicting the development of the production process of thermophilic vegetables and yield parameters of new oilseed rape varieties tested in the context of climate change. For the research on thermophilic vegetables and oilseed rape, soil-plant-atmosphere growth models included in the Decision Support System for Agrotechnology Transfer (DSSAT) models were used, and their outputs were validated by experiment under field conditions. The methodology illustrates the need for stronger linkages between experiments and growth models from defining the problem to validating and solving new research questions. For the first time, the ability of the CROPGRO-Tomato, CROPGRO-Papper and CROPGRO-Canola models to simulate growth, development and yield parameters of thermophilic vegetables (tomato variety TORNÁDO F1 and hybrid pepper Superamy F1) and three oilseed rape varieties (Architect, Temptation and Sněžka) with different soil and climatic conditions in the Czech Republic was investigated. It is connected to the ongoing field experiments for the validation of these models to the required extent, which has not yet been carried out in the Czech Republic. Since there is currently no developed research on vegetable cultivation in the Czech Republic, this methodology will provide new and crucial insights for developing different scenarios of possible adaptations for the model crop and assessing the effectiveness of adaptation measures. Scenarios of coupled climate risk impacts on the soil-plant-atmosphere cropping system in the context of climate change were developed. It mapped the projection of perspective areas in terms of tomato cultivation according to three regional climate models (the coldest and drier, the middle estimate and the warmest at the same time wetter model) across the territory of the Czech Republic. In addition, the risk of damaging spring frosts according to current and future climate models and scenarios across the territory of the Czech Republic was mapped. In the Environmental Module of DSSAT was created temperature impact scenarios combined with an increase in CO2 concentration, or a decrease/increase in precipitation during tomato and pepper crop cycles. This work is a response to the results of testing rapidly evolving modern varieties adapted to ongoing changes not only in climatic conditions but also to changes in market demands.



Lokalita	Klimatické oblasti	Nadmořská výška (m n. m.)	Dlouhodobá průměrná teplota (°C)	Dlouhodobé úhrn srážky (mm)
Staňkov	Mírně teplá	370	8.1	537
Chrastava	Teplá	345	7.1	738
Vysoká	Chladná	585	8.0	611

1. Architect
2. Temptation
3. Sněžka



### Selected cultivars:



Tornado F1

<b>Specific feature</b>	Full range of disease resistance.
<b>Maturity</b>	Medium
<b>Plant</b>	Indeterminate
<b>Fruit</b>	High resistance to cracking of fruits
<b>Fruit weight</b>	110-120 grams



Baikal F1

<b>Specific feature</b>	Are resistant to various kinds of diseases
<b>Maturity</b>	Medium
<b>Plant</b>	Middle-strong tall
<b>Fruit</b>	The pulp has a medium-density structure without bitterness.
<b>Fruit weight</b>	250 - 350 grams



Superamy F1

<b>Specific feature</b>	Big and heavy fruit.
<b>Maturity</b>	Early
<b>Plant</b>	Tall hybrid
<b>Fruit</b>	It has cone-shaped fruits with a length of about 15 cm the fruits taste is sweet.
<b>Fruit weight</b>	110-130 grams



Assoc Prof. Dr. Mgr. Vera Potopová  
potop@af.czu.cz

<https://katedry.czu.cz/karp/uvod>

Link to the book: DOI:10.13140/RG.2.2.31887.56486

### Acknowledgements

SustES and TA ČR Prostor pro život SS02030027 - [www.centrum-voda.cz](http://www.centrum-voda.cz)