

Adaptation of the VegSyst model to outdoor conditions for sweet pepper

Jose Maria Vadillo¹, Carlos Campillo¹, Carmen Giménez², Valme González¹, Maria del Henar Prieto¹



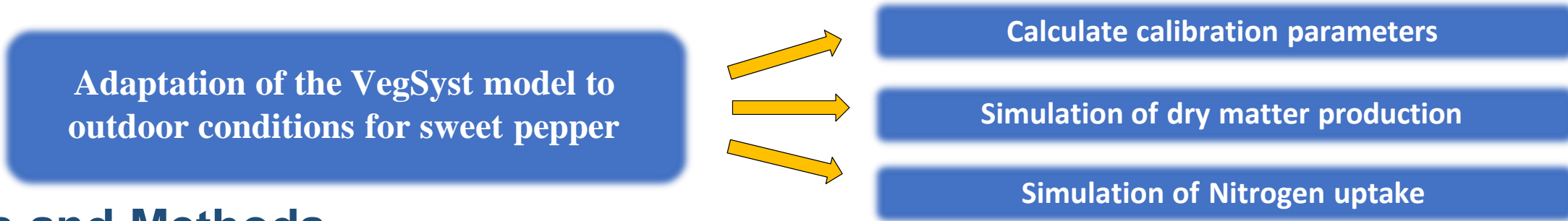
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Contact : josemaria.vadilloh@juntaex.es



¹ CICYTEX (Centro de Investigaciones Científicas y Tecnológicas de Extremadura), Ctra. A-V, Km372, 06187 Guadajira, Badajoz
² Departamento de Agronomía, Universidad de Córdoba, Campus de Rabanales, Edif. Celestino Mutis, 14014 Córdoba

Introduction and objectives



Materials and Methods



- ❖ Extremadura, Spain. (38° 51' 2.534", -6° 40' 14.735")
- ❖ Randomized blocks with 4 replications
- ❖ 108 m² surface per experimental unit
- ❖ Beds 150 cm wide
- ❖ Plant density: 33.333 plants/ha

4 treatments of N:

- NO: Null
- N1: Deficient (-50% N₂)
- N2: Traditional
- N3: Exceeding (+50% N₂)

Simulation of Nitrogen uptake

$$\%N_i = a \times DMP_i^{-b}$$

Simulation of dry matter production

$$DMP_i = T_i \times TUE \times VPD^{-b}$$

$$DMP_i = f_i - PAR_i \times RUE$$



Fig. 1 Variety pepper crop

Results

Crop growth parameter

T_{upp} (°C)	40
T_{low} (°C)	10
f_0	0.005
f_f	0.88
f_{mat}	0.88
$RTT_{0.5}$	0.348
CTT_f (°C-day)	1522
CTT_{mat} (°C-day)	1715
α	9
RUE	2.10
TUE	6.40

The value of RUE is more similar to spinach (2.2) and processing tomato (2.3) describe in (Giménez et al., 2019) than greenhouse pepper (4.01) describe in (Giménez et al., 2013) because of the management in open field.

Critical N curve parameters

a	4.522
b	-0.392

Table 1: Calibration coefficients of the VegSyst processing outdoor pepper model

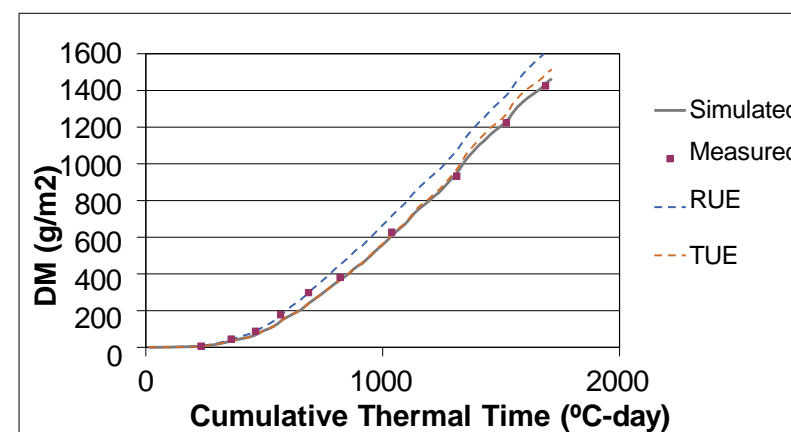


Fig. 2 CTT (°C-day) course of the simulated and measured values of DMP (g/m²)

RUE and TUE methodology versus the real measurements of dry matter produced by the crop. Finally, the evolution of the model is observed in the figure (simulated) by choosing daily between RUE and TUE, coinciding each day with TUE because VPD is the most limiting factor in the open air conditions.

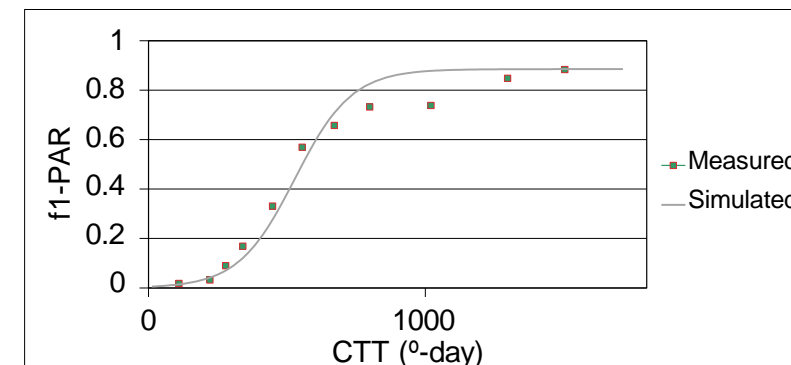


Fig. 3 CTT (°C-day) course of the simulated and measured values of intercepted PAR (fi-PAR)

The relationship between %N and DMP was determined by fitting an exponential curve to measured values. The calibration coefficients obtained for this relationship were $a = 4.522$ and $b = -0.392$.

Conclusions and perspectives

- The VegSyst model has been calibrated to simulate daily dry matter production and nitrogen uptake for the outdoor processing pepper crop. It has been obtain the critical nitrogen curve $\%N_{crit} = 4.522 \times DMP^{-0.392}$.
- Determining the RUE value, it is observed that there is more similarity between the results of different crops under the same management than the same crop under different management.
- The simplicity of the model makes it suitable for incorporation into a DSS in order to provide daily estimates of the N requirements of the studied crop and the possibility of adapting more and more outdoor crops in the future.

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