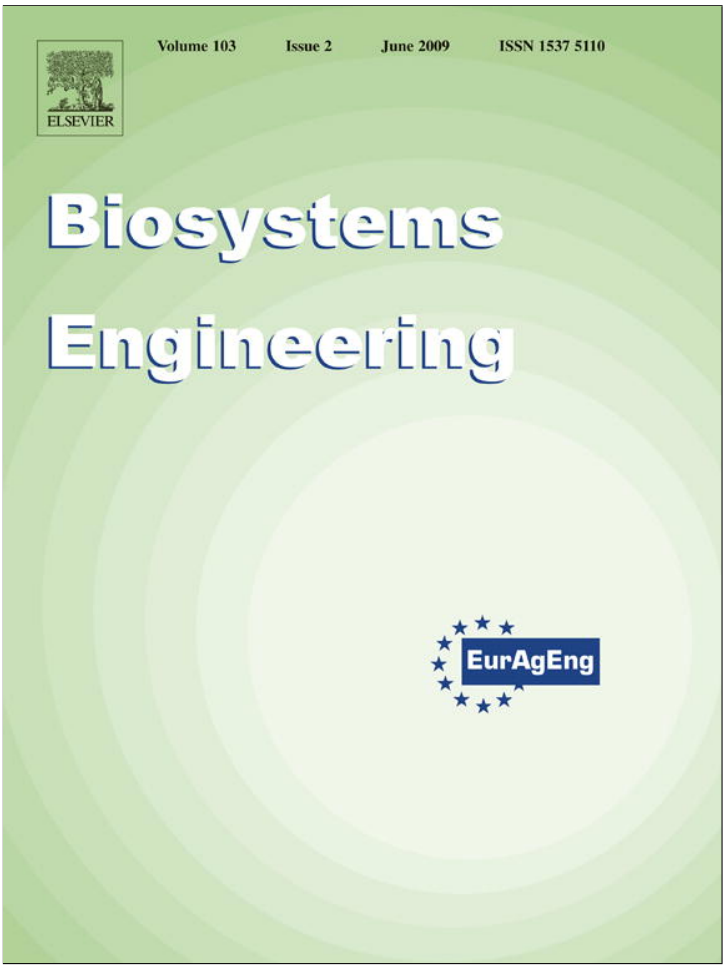

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Calibration and validation of a biological model to simulate the development and production of tomatoes in Mediterranean greenhouses during winter period

G. Dimokas[a], M. Tchamitchian[b], C. Kittas[a,*]

[a]University of Thessaly, School of Agricultural Science, Dept. of Agriculture Crop Production & Rural, Env., Fytokou Str, 38446 N. Ionia, Magnesias, Greece

[b]Écodéveloppement, INRA, Domaine Saint-Paul, Site Agroparc, 84914 Avignon Cedex 9, France

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The aim of this work is to calibrate and validate the adaptation of TOMGRO (TOMato GRowth), a crop growth simulation model for tomato, to the short-term cropping technique and to conditions in Greece. Current practice in plastic greenhouses in Mediterranean regions is to stop the indeterminate development of the plant after a limited number of trusses by removing the terminal bud of the plant (*i.e.* topping). Experiments were carried out in the farm of the University of Thessaly, Volos, Greece, during the autumn and winter periods of 2005 and 2007. Crop development, growth and greenhouse climate were measured. Results showed that dry matter partitioning in the plant was not altered by the topping of the plant but the duration of the life of the fruit, from setting to maturity, was shortened. The TOMGRO model was modified accordingly, calibrated over the winter 2005 data and then using data from winter 2007. Good agreement was observed between the measured and simulated plant development indicators, biomass and fruit production. Satisfactory agreement was obtained for the plant leaf area (LA), usually one of the weak points of TOMGRO. Based on these results, we conclude that this adaptation of TOMGRO accurately simulates the development of short-term tomato crops grown in greenhouses and can therefore be used for decision support to help growers optimise the operation of the greenhouse.

1. Introduction

Over the last few decades, protected cultivation has developed around the world. Globalisation of the markets has increased competitiveness, highlighting the need for products of high quality. In the past, due to the limited use of greenhouse climate control, production strategies in the Mediterranean greenhouse industries mainly focussed on the adaptation of the crops to suboptimal environments (Castilla, 1994). This trend has a limit, and following the trend observed for northern greenhouse production, adequate climate control and biological management are now necessary in order to improve the production of these simplified Mediterranean systems (Baille, 2001). Previous research has suggested that the cost of crop production can be decreased with the help of biological models (van Straten *et al.*, 2000) because they are

* *Corresponding author.*
E-mail addresses: gedimoka@uth.gr (G. Dimokas), arm@avignon.inra.fr (M. Tchamitchian), ckittas@uth.gr (C. Kittas).
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