Modelling Competition for Nutrients between Microbial Cultures Growing on Solid Agar Surfaces

Author: Daniel Boocock; Supervisor: Dr Conor Lawless

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ABSTRACT

Motivation: The fitness of microbial strains can be estimated from the growth of cultures inoculated onto solid agar. In high-throughput procedures, an array of cultures is grown on the same agar plate and competition for nutrients between cultures is likely to affect growth. However, analysis assumes that cultures grow independently. We test a model of nutrient dependent growth and diffusion and try to correct for competition to provide more accurate and reliable fitness estimates.
Results: What should we say?
Availability and Implementation: CANS, a Python2 package developed for the analysis in this paper, is freely available from github pypi.
Contact: daniel.boocock@protonmail.ch

1 INTRODUCTION

Dummy Lawless *et al.* (2010) citations (Heydari *et al.*, 2016) (Addinall *et al.*, 2008).

1.1 Subsection

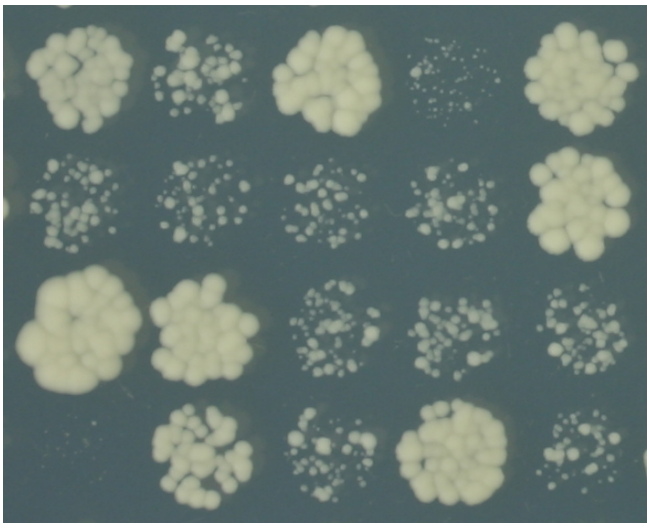

Figure 1: *A section of a plate from a QFA experiment (Addinall* et al.*, 2011).*

2 METHODS

2.1 Subsection

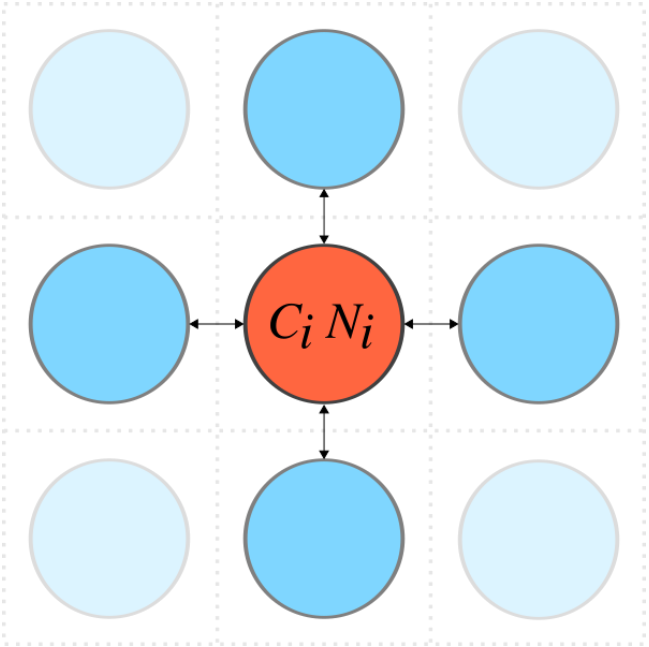

Figure 2: *Schematic of the modelling approach. Each circle represents a culture, indexed i, on solid agar and arrows represent diffusion of nutrients. C_i - amount of cells; N_i - amount of nutrients; darker blue circles- neighbourhood δ_i.*

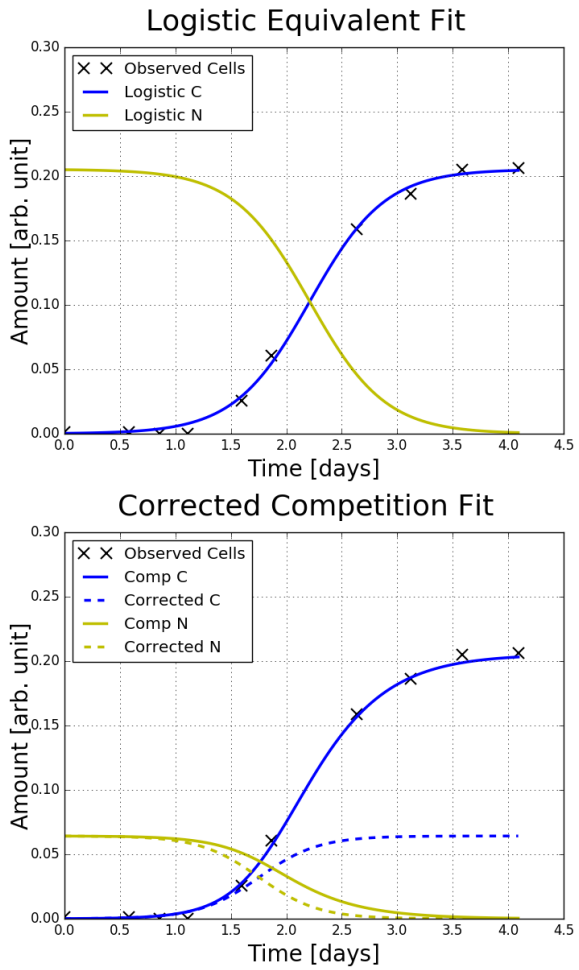

Figure 3: *PUT KN VALUES (and r and K) ON THE PLOT. (Could even put obj fun values). Fits to culture (R10, C3) of P15 (Addinall* et al.*, 2011) illustrating how the competition model can be seen as a correction to the logistic model. C - Cells; N - Nutrients. Top - Logistic Equivalent Fit; Bottom - Competition Fit (solid) and Corrected Logistic Equivalent Fit (dashed).*

3 RESULTS

(Palková *et al.*, 1997)

3.1 Subsection

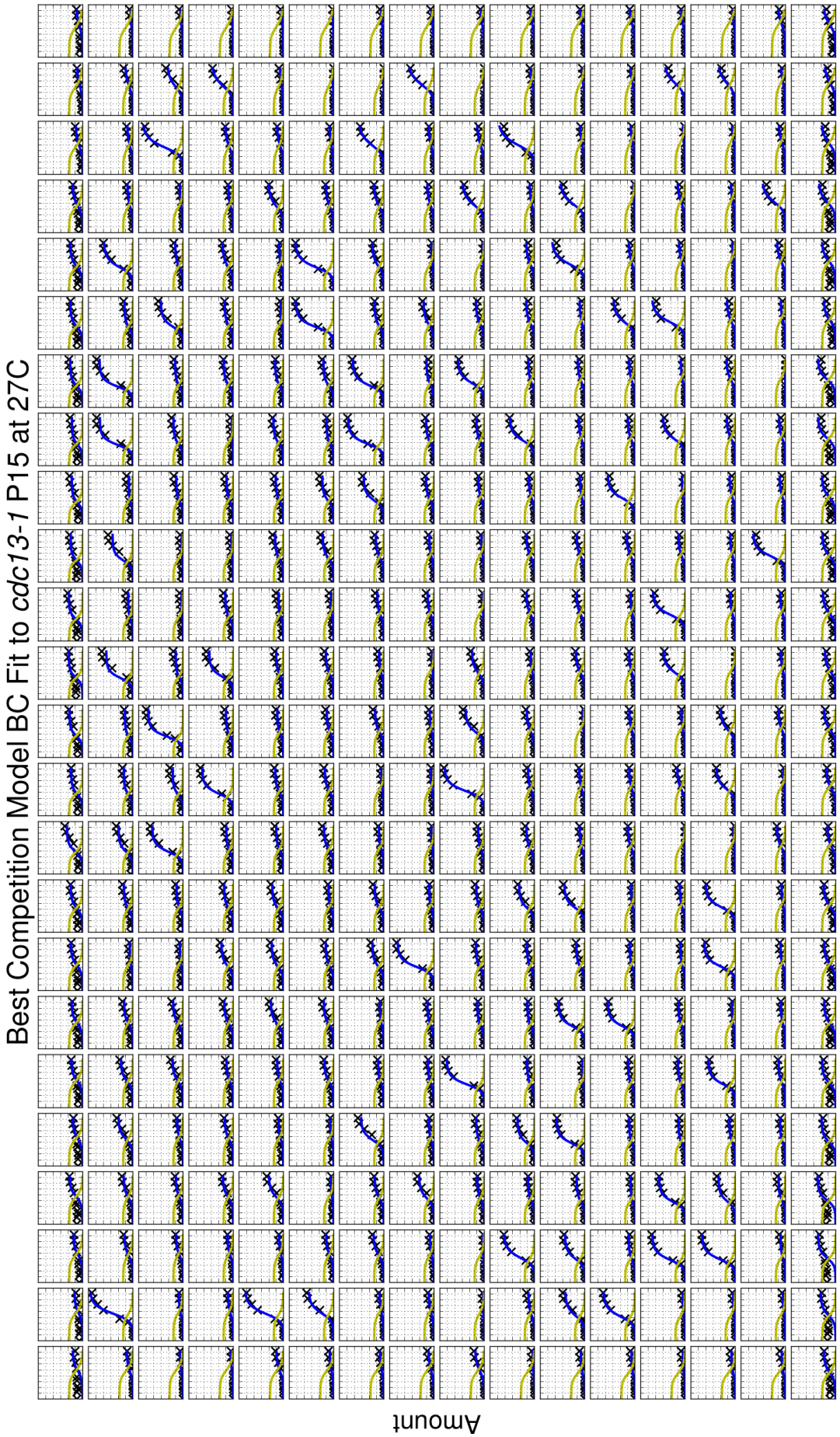

Figure 4: *(R5, C18) P15*

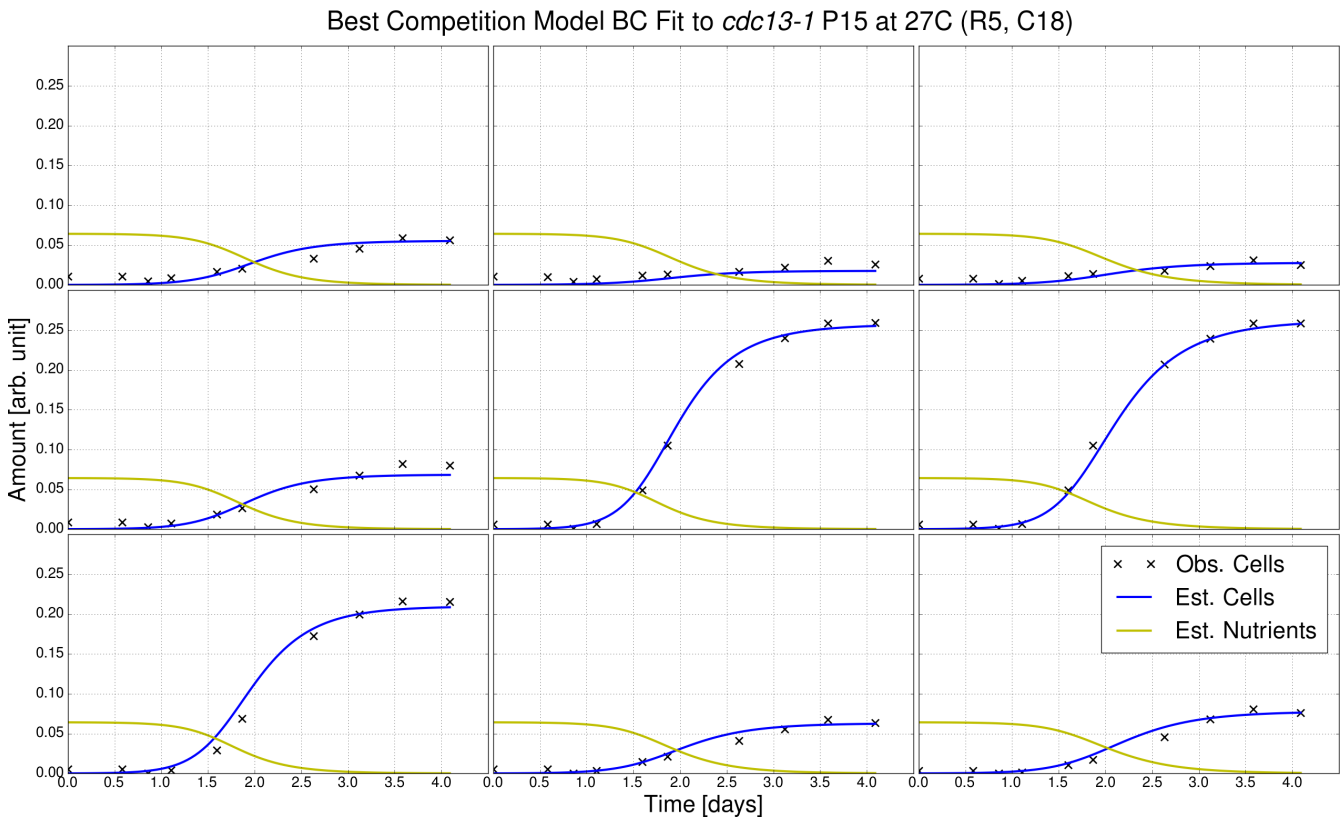

Figure 5: *(R5, C18) P15*

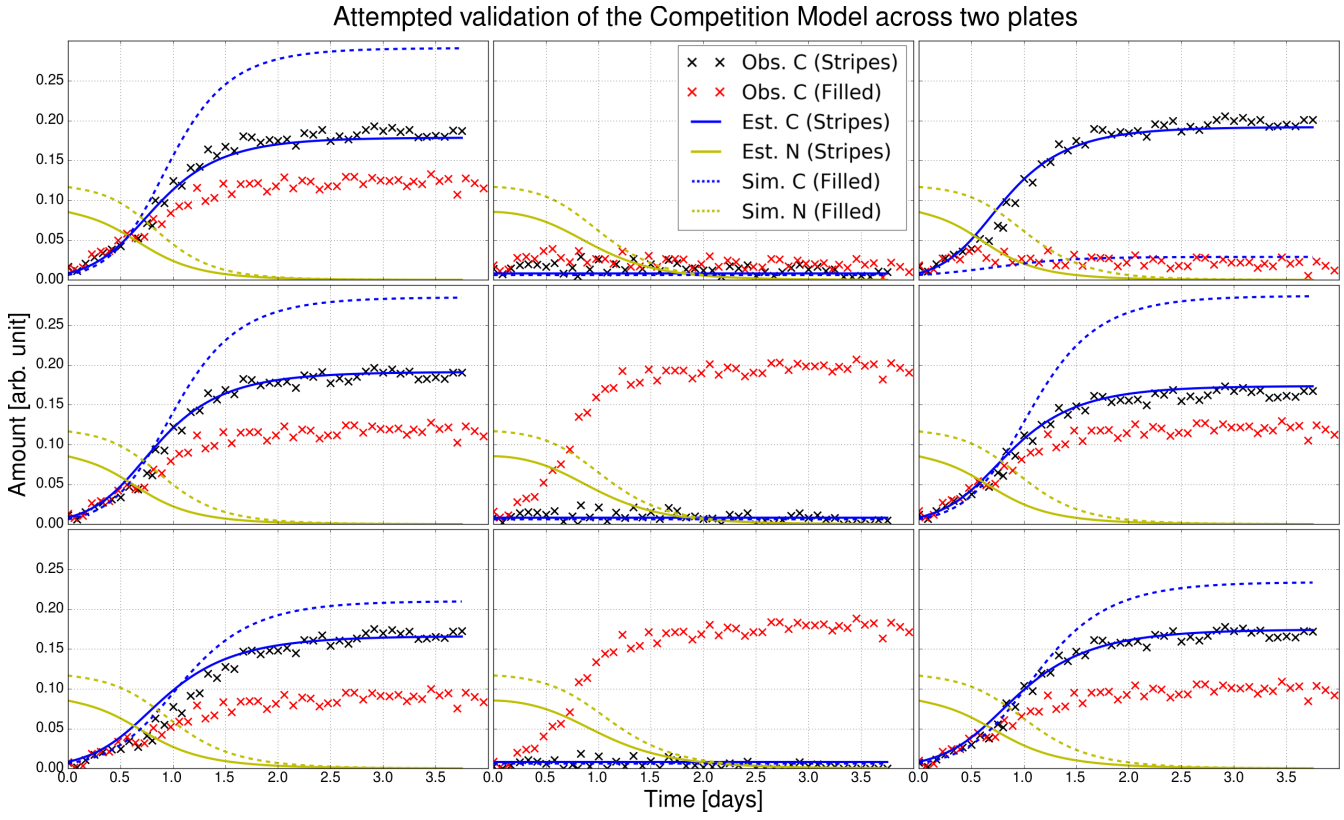

Figure 6: *(R9, C10) top-right possible pinning mistake. Bottom-left not close to any such mistake.*

4 DISCUSSION

4.1 Subsection

REFERENCES

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