INFLORESCENCE DEVELOPMENT IN TOMATO: LINKING GENE FUNCTION WITH A ZIGZAG MODEL

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Genetic Variation of Flowering Time Genes and Applications for Crop Improvement

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INFLORESCENCE DEVELOPMENT IN TOMATO

A. Vegetative phase

SAM

SYM

TM

Reproductive phase

FM0

IM1

F0

FM1

IM2

F0

FM2

IM3

SYM

TM

FM

SYM

IM

F

0

1

2

3

IM

1

2

3

4

5

6

7

8

9

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EXISTING MODELS OF INFLORESCENCE DEVELOPMENT

PRUSINKIEWICZ ET AL. 2007

VEGETATIVENESS OF MERISTEMS DECREASE WITH AGE AND DEFINE THE INFLORESCENCE ARCHITECTURE

PARK ET AL. 2012

MATURATION RATE OF MERISTEMS DEFINES THE OVERALL INFLORESCENCE ARCHITECTURE
AIM OF THE PROJECT

CREATE A SIMPLE MODEL OF INFLORESCENCE DEVELOPMENT THAT CAN ACCOUNT FOR ALL EXISTING PHENOTYPES OBSERVED IN TOMATO
VEGETATIVE GAIN AND LOSS GENERATES A ZIGZAG MODEL

FLORAL TRANSITION
LEAF REPRESSION

FLORAL COMMITMENT
MERISTEM REPRESSION

VEGETATIVE GAIN
\[ΔV\]

VEGETATIVE LOSS
\[dV\]
ZIGZAG MODEL: DECREASING VEGETATIVE LOSS [dV]

FLORAL TRANSITION
LEAF REPRESSION

FLORAL COMMITMENT
MERISTEM REPRESSION

TIME [PLASTOCHONS]

MERISTEM VEGETATIVENESS [-]
ZIGZAG MODEL: INCREASING VEGETATIVE LOSS [dV]

TIME [PLASTOCHONS]

MERISTEM VEGETATIVENESS [-]

FLORAL TRANSITION
LEAF REPRESSION

FLORAL COMMITMENT
MERISTEM REPRESSION

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ZIGZAG MODEL: INCREASING VEGETATIVE GAIN [$\Delta V$]

FLORAL TRANSITION
LEAF REPRESSION

FLORAL COMMITMENT
MERISTEM REPRESSION

TIME [PLASTOCHONS]
THE ZIGZAG MODEL IS USED TO GENERATE A MORPHOSPACE

ΔV: 0 → 3
dV: 0 → 20

RUN THE MODEL

QUANTIFY THE OUTPUT

ΔV

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THE ZIGZAG MODEL IS USED TO GENERATE A MORPHOSPACE

- **sft s**
  - Lippman et al., 2008, PLoS Biology

- **falsiflora (fa)**
  - LFY
  - Allen and Sussex, 1996, Planta

- **anantha (an)**
  - UFO
  - Allen and Sussex, 1996, Planta

- **compound inflorescence (s)**
  - WOX9
  - McAlister et al., 2004, Planta

- **jointless (j)**
  - AGL24
  - McAlister et al., 2012, Nature Genetics

- **single flower truss (sft)**
  - FT
  - Molinero-Rosales et al., 2004, Planta

- **terminating flower (tmf)**
  - Szymkowiak and Irish, 1999, Plant Cell

- **Zigzag**
  - Périlleux et al. | Genetic Variation of Flowering Time Genes and Applications for Crop Improvement | Bielefeld - 24 March 2014
GENE FUNCTIONS WITHIN THE ZIGZAG MODEL

- **Vegetative Gain**: FA, J, SFT
- **Vegetative Loss**: FA, S, J, TMF
- **Floral Transition**: FA, SFT
- **Floral Commitment**: AN

**Gene Functions**

- **Meristem Vegetativeness [-]**
- **Time [Plastochrons]**

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THANK YOU FOR YOUR ATTENTION

ANY QUESTIONS?