IMPROVING SENESCENCE ALGORITHMS IN PLANT GROWTH MODELS TO SIMULATE GRASSLAND CURING RATES

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Introduction
• Grass Curing percentage
  - The proportion of dead material in a grassland as a result of senescence
  - Surrogate for live fuel moisture content
  - Grassland becomes more desiccated and flammable as curing increases
• Agricultural plant growth decision support tools (DST)
  - Focus on the growth stages, rather than the senescence of grasses
  - Have the potential to model the senescence (curing) of grasses
• This project aims to provide the senescence algorithms to adapt these DST’s to allow curing to be modelled across the temperate zones of southern Australia and New Zealand.

Glasshouse Trial
• 4 common grasses grown under ideal conditions (Fig. 2)
  - Annuals - wheat, annual ryegrass
  - Perennials - phalaris, wallaby grass
• Measurements
  - Length of green and senescing leaf components
  - Numbers of leaves and tillers
  - Phenological stage of the tiller
• Calculations
  - Rates of leaf appearance, elongation, and senescence
  - Leaf life span

Results
• Species differed in
  - Rates of leaf turnover
    - Appearance (Fig. 3)
    - Elongation (Fig. 4)
    - Senescence (Fig. 5)
  - Leaf length (Fig. 7)
  - Numbers of leaves and tillers

Discussion
• Leaf turnover rates often changed as more leaves were produced
  - Inverse polynomial relationships
• Next steps
  - Combine models to calculate the percentage of green and cured leaf over time
  - Include these models in agricultural decision support tools (DST) such as GrassGro™
  - Simulate temperate grassland curing in spring and summer
  - Test the simulations against field data of onset and duration of curing in these species
• Potential innovations
  - Confirm or supplement other curing sources such as visual estimates or remote sensing
  - Test various agronomic strategies to modify curing onset and duration (such as in Fig. 8)
  - Predict future curing percentages and the timing of curing
  - Some DST’s take account of current weather conditions and provide probability of future events, e.g. DST may predict a 75% probability that a given area of grassland will have cured to 75% within a fortnight of a hot north wind event in October in southern Australia
  - Predict the timing of suitable curing rates
  - Allow effective prescribed burns
  - Identify grasslands no longer safe to burn
• Benefits for fire agencies
  - Improved ability to identify areas to conduct timely and safe prescribed burning
  - Improved fire danger assessments in grasslands - aiding prevention and response planning

References