Unlocking Typha: How to boost fibre production

Typha latifolia Knowledge Exchange

Monday 8th December 2025

NATURAL ENGLAND

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ADAS NATURAL SOLUTIONS

Part of the RSK Group

Overview

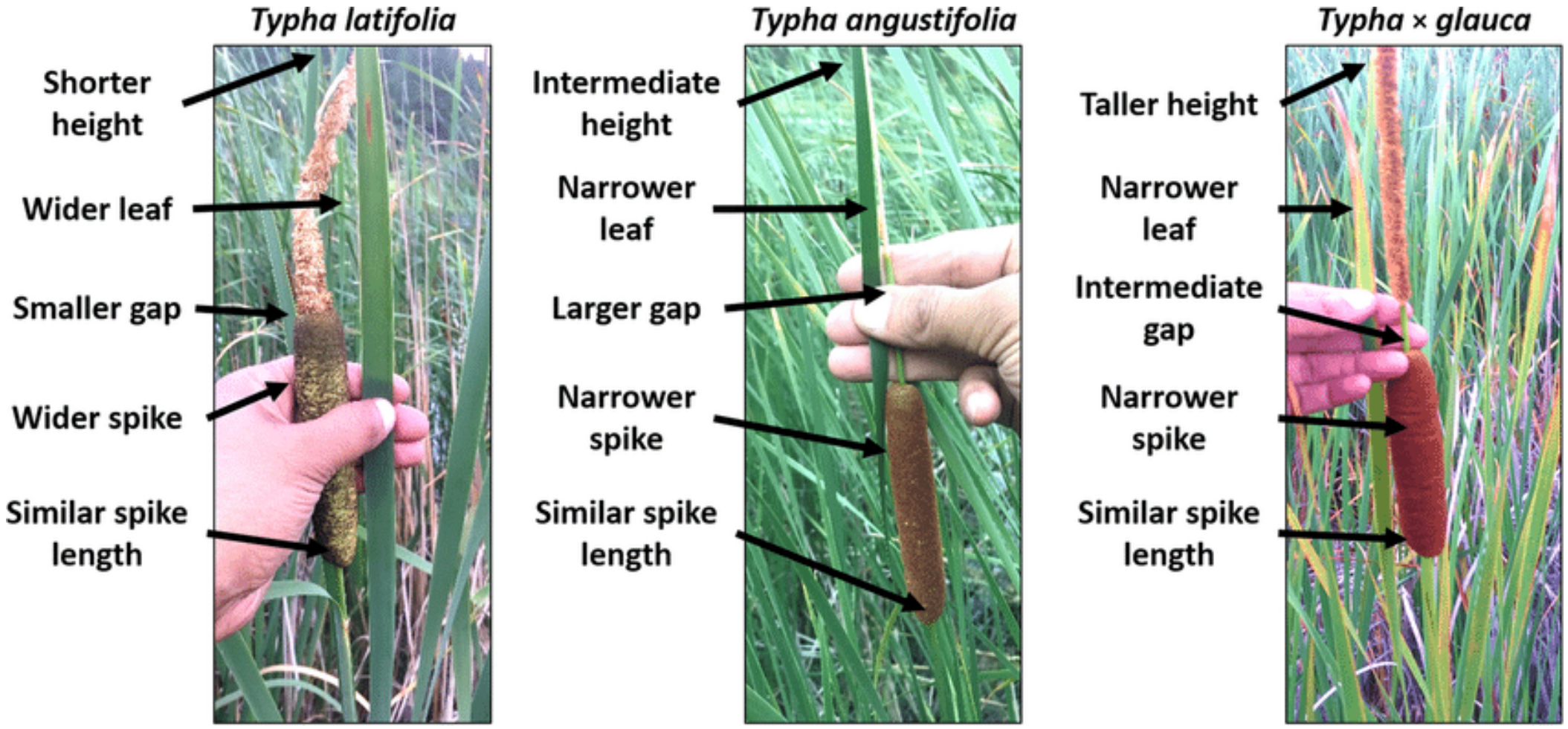
Challenge:

- Develop production of Typha seed heads:
  - Identify factors favouring generative shoot (seed head) development;
  - Improve proportion of generative to vegetative shoots (maximum ~15 seed heads/m^2)

Agenda:

- Site investigations and literature review
- Trial design and establishment
- Year 1 & 2 results and observations
- Pest damage and management
- Knowledge gaps and next steps

Typha Species



Source: 10.1007/s11273-021-09823-7

Harvestable products

FIBRE

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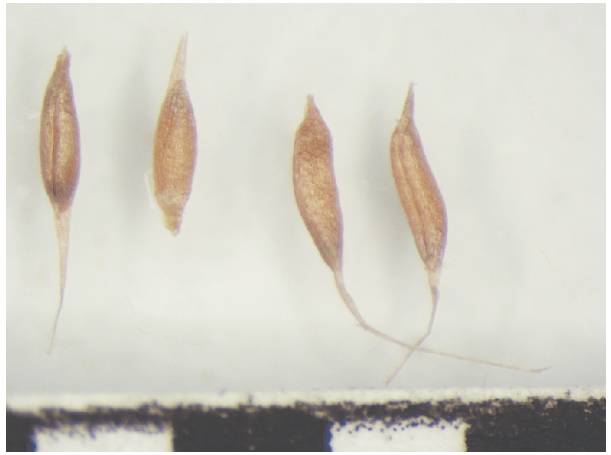
- Alternative to synthetic insulating materials

SEED



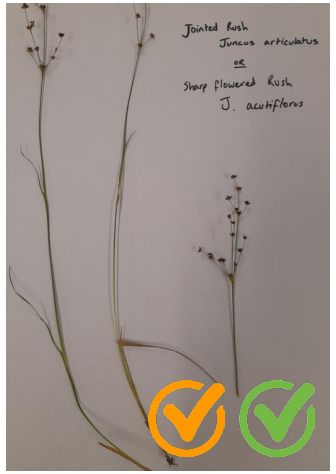
- Sowing material
- Oil seed (~17% oil by weight) and meal

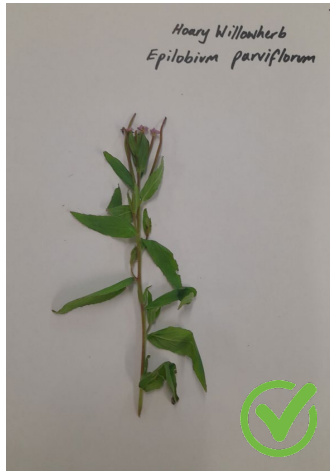
POLLEN

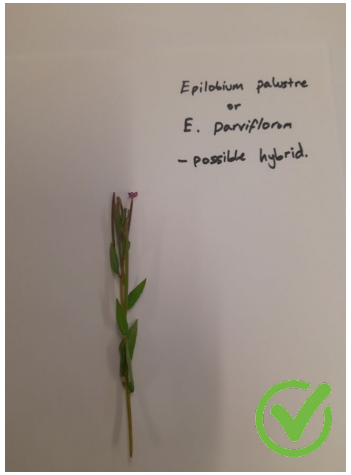
- Nutritional supplement & Chinese medicine, e.g. 'Pu Huang'
- Feeding predatory mites, e.g. commercial product: Nutrimite™
- Fireworks / fire lighting
- Baking

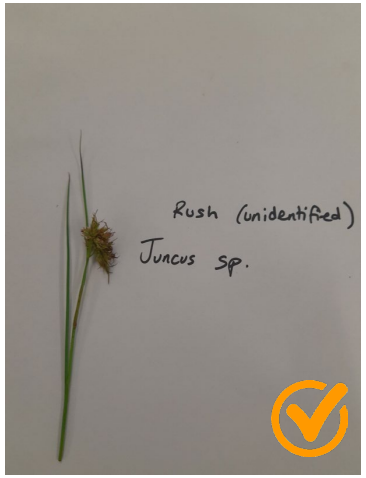
Sources: 10.5772/64084; 10.1007/BF02641179; Nutrimite; 10.1007/s10526-021-10116-4

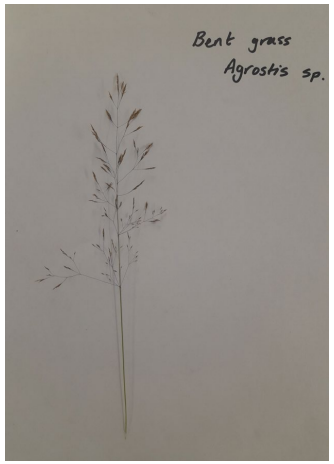
Indicator species and water table depth

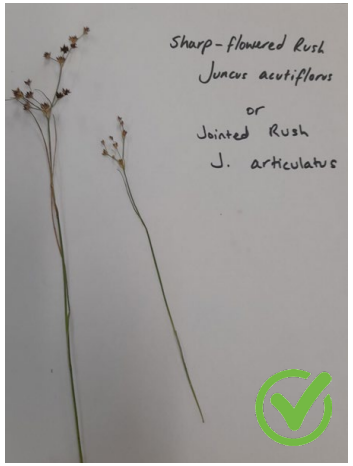








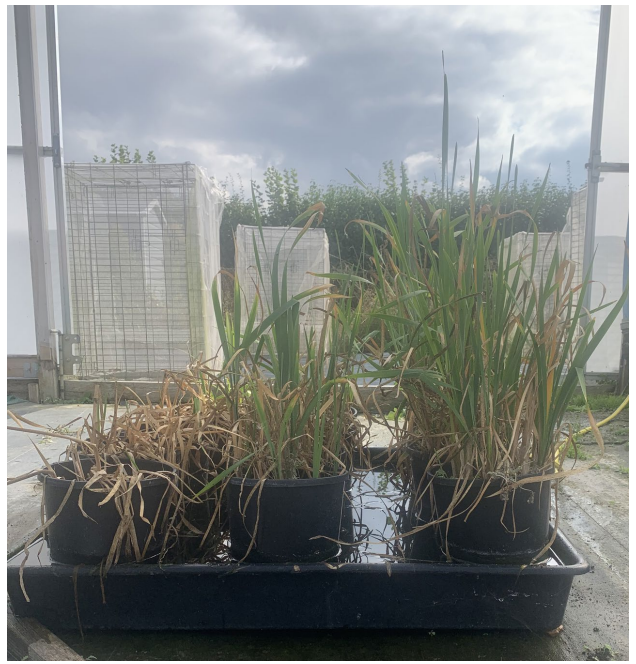




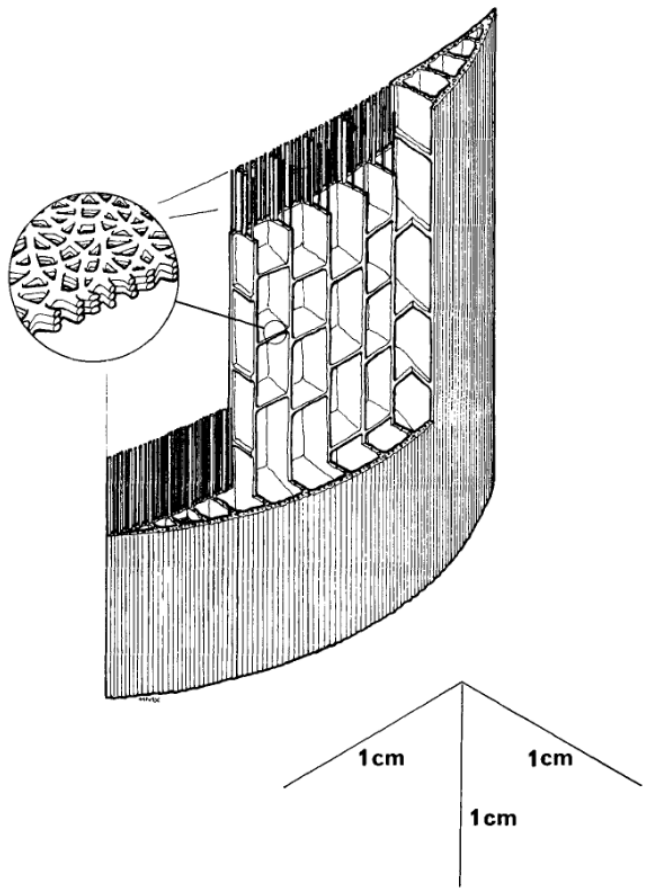
High Seed Head Numbers

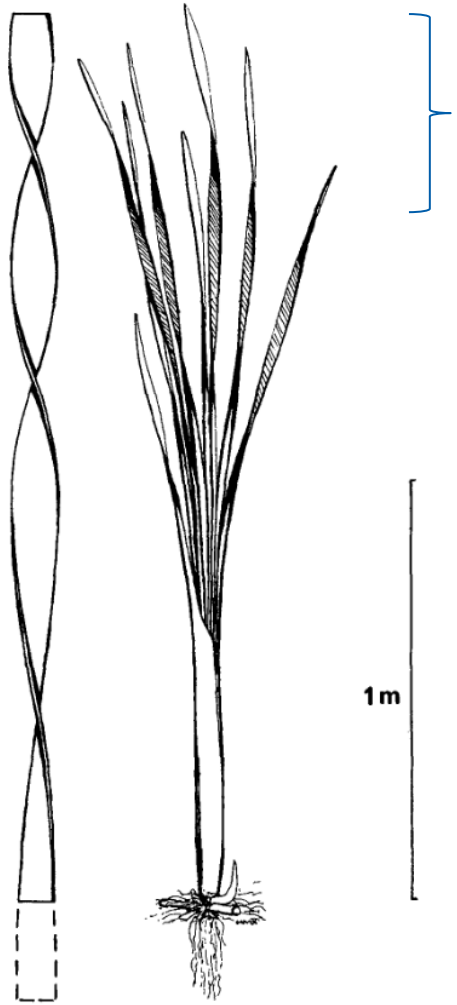
Low Seed Head Numbers

- Willowherbs and rushes occupy a broader ecological range
- Bentgrass and Yorkshire fog prefer wet but not waterlogged soils



Aerenchyma Extent





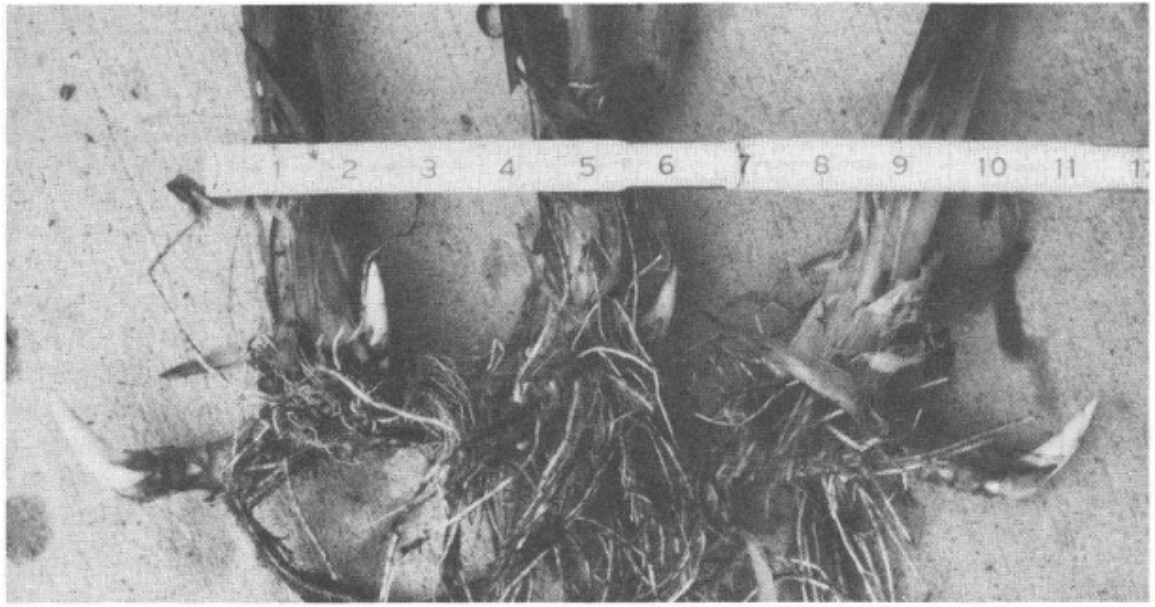
Aerenchyma structures in top ~1ft of leaf blades are smaller / non-existent.

Source: 10.1111/j.1095-8339.1992.tb00289.x

Floral Induction

- Floral induction is mediated through multiple pathways
  - Floral inductive signals induce the transformation of a **mature vegetative SAM** (Shoot Apical Meristem) to a reproductive state.
  - External stimuli may include: photoperiodic, light quality (i.e. intensity and light wavelengths), temperature (including vernalization), autonomous (e.g. plant size, age or leaf number), and hormonal.
- Floral induction timing in *Typha latifolia* is believed to be controlled by **photoperiod** and **temperature**.
- **Physiological maturity** (i.e. autonomous) must proceed the environmental ques. Believed to be linked to rhizome size (carbohydrates stored in rhizome), rather than age of plant.

Typha Rhizome

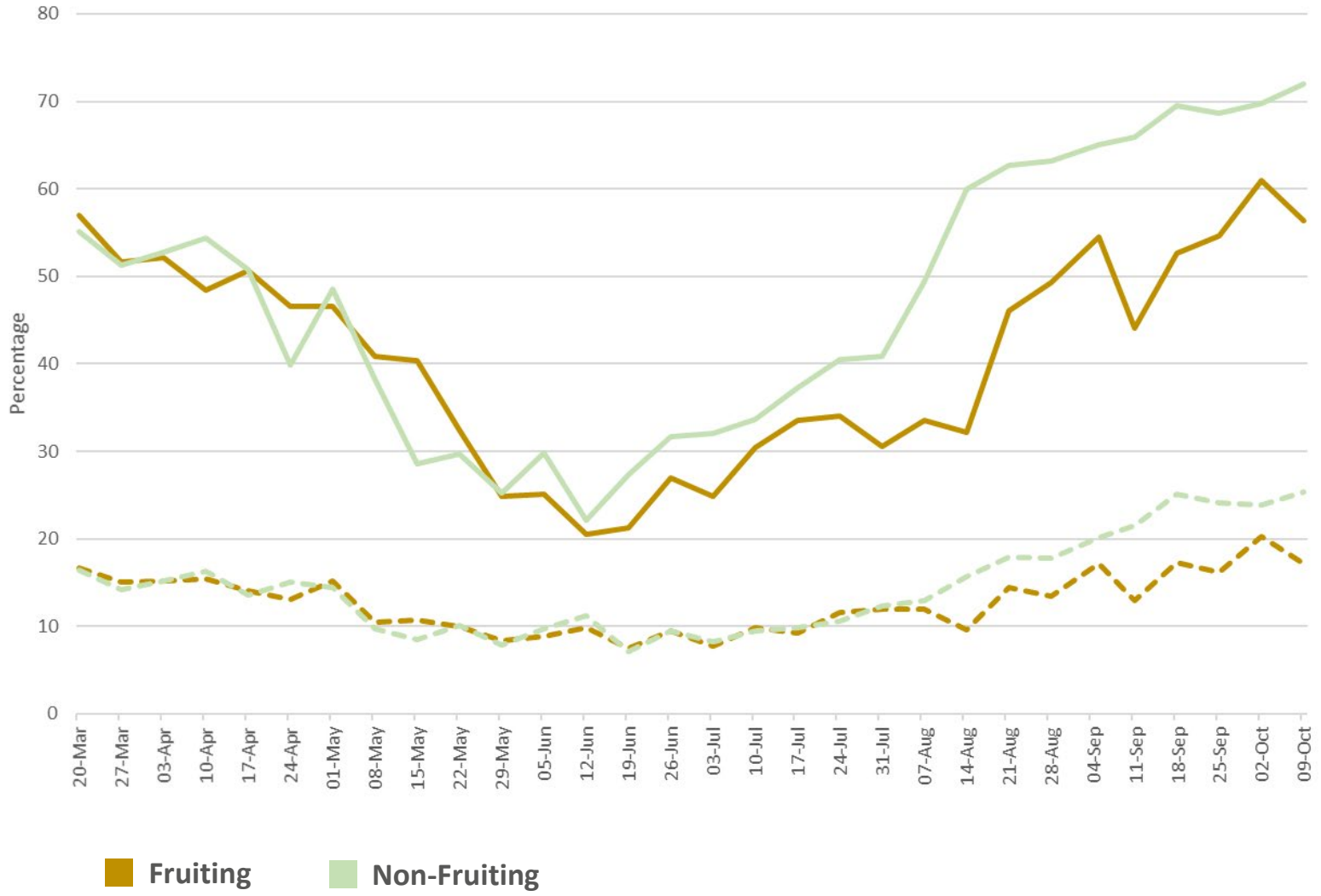


New rhizome growth on plants which have **flowered** are usually short.

Plants which have **not flowered** usually produce longer rhizomes than the plants which have flowered.

Source: Cattail

Carbohydrate Reserves in Rhizome

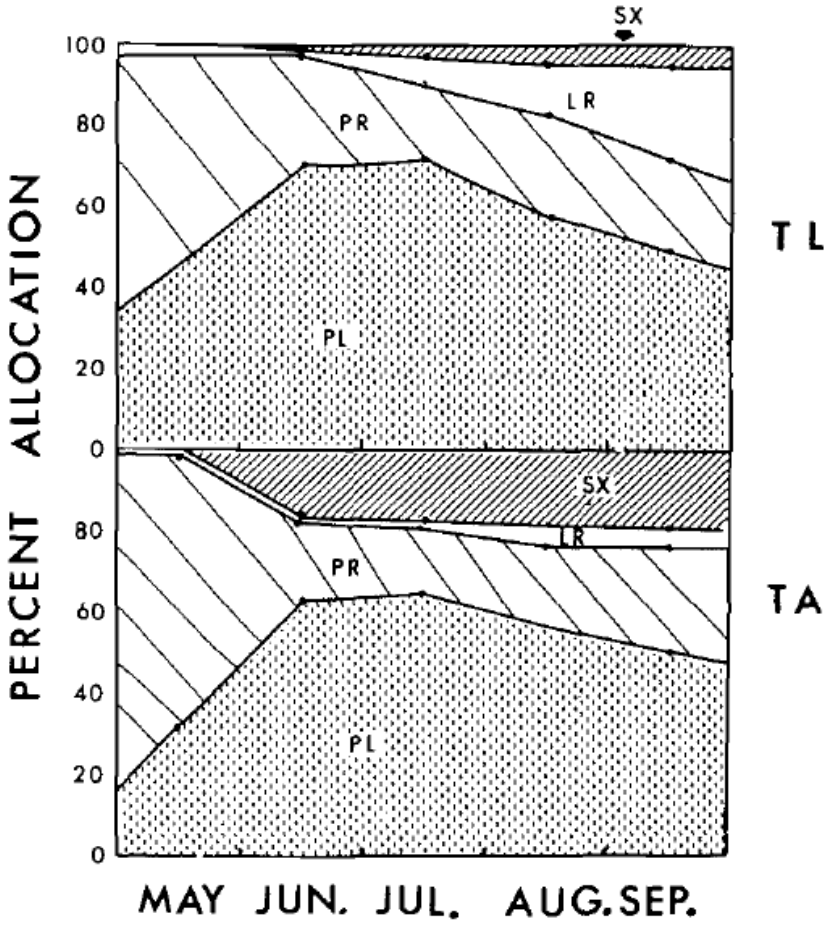


Readily hydrolysable carbohydrate root reserve in oven-dry rhizome (remainder: structural elements)

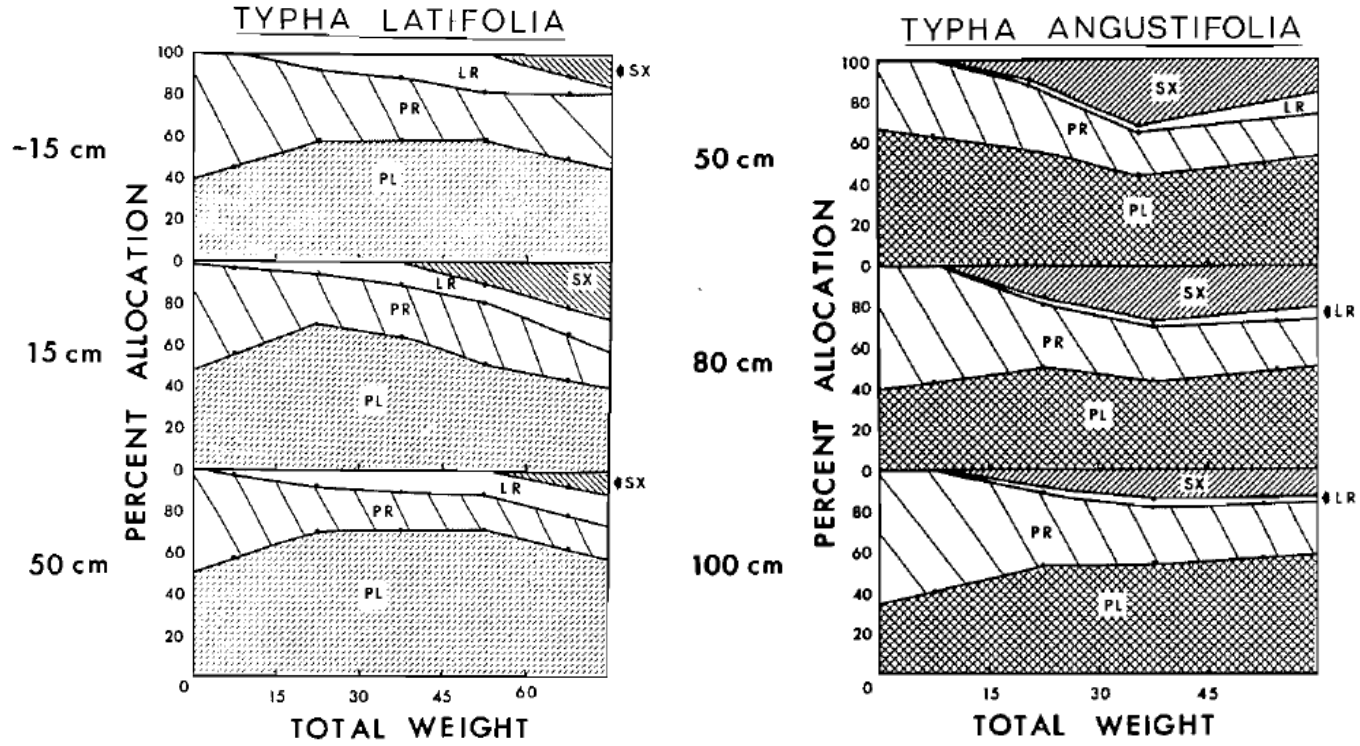
Dry matter in fresh rhizome (remainder: water)

Adapted from: [USDA, 1954]

Biomass Allocation & WTD



Biomass allocation through time averaged over all depths



Biomass allocation with water depth for T. latifolia and T. angustifolia

SX: sexual structures (flowers, fruits, and flowering stalk);
LR: lateral ramet;
PR: rhizome of the parent ramet;
PL: leaves of the parent ramet.

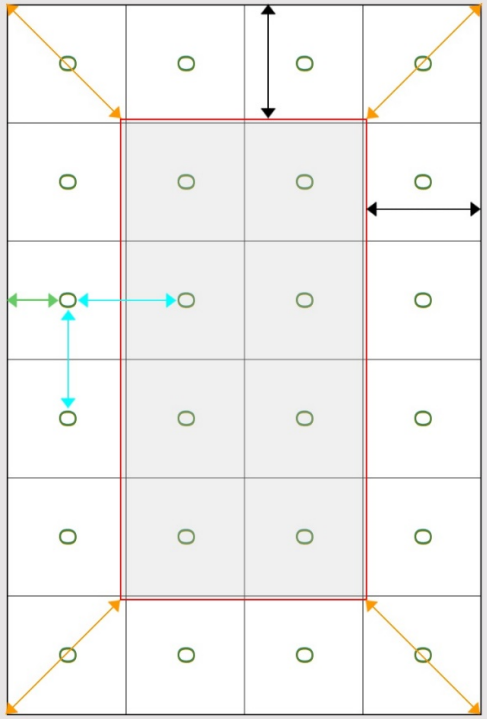
Source: [10.1139/b82-007](https://doi.org/10.1139/b82-007)

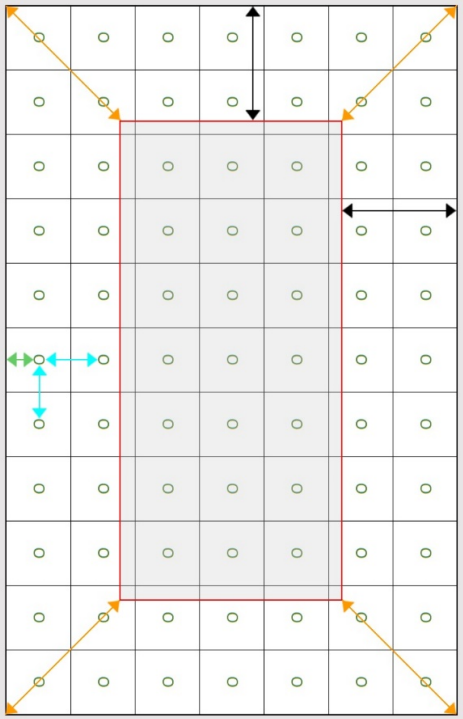
Typha Rhizome

- Cell: width 5cm; depth 8cm
- Medium: peat-free aquatic mix
- All rhizomes sourced from the same batch

Container Replicated Trials

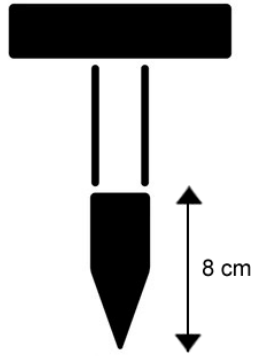
30 Rhizomes/m^2	100 Rhizomes/m^2

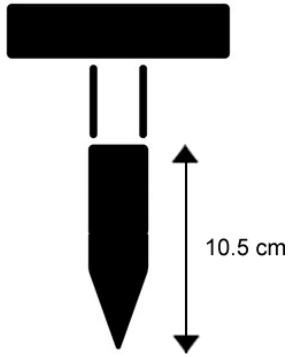


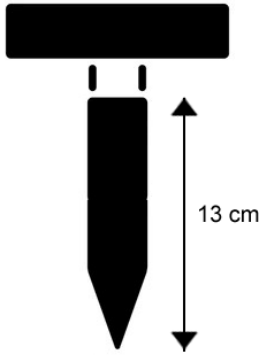


Layout and spacing of rhizomes, at different planting densities, including assessment area

LEVEL WITH SURFACE	2.5 cm BELOW SURFACE	5 cm BELOW SURFACE







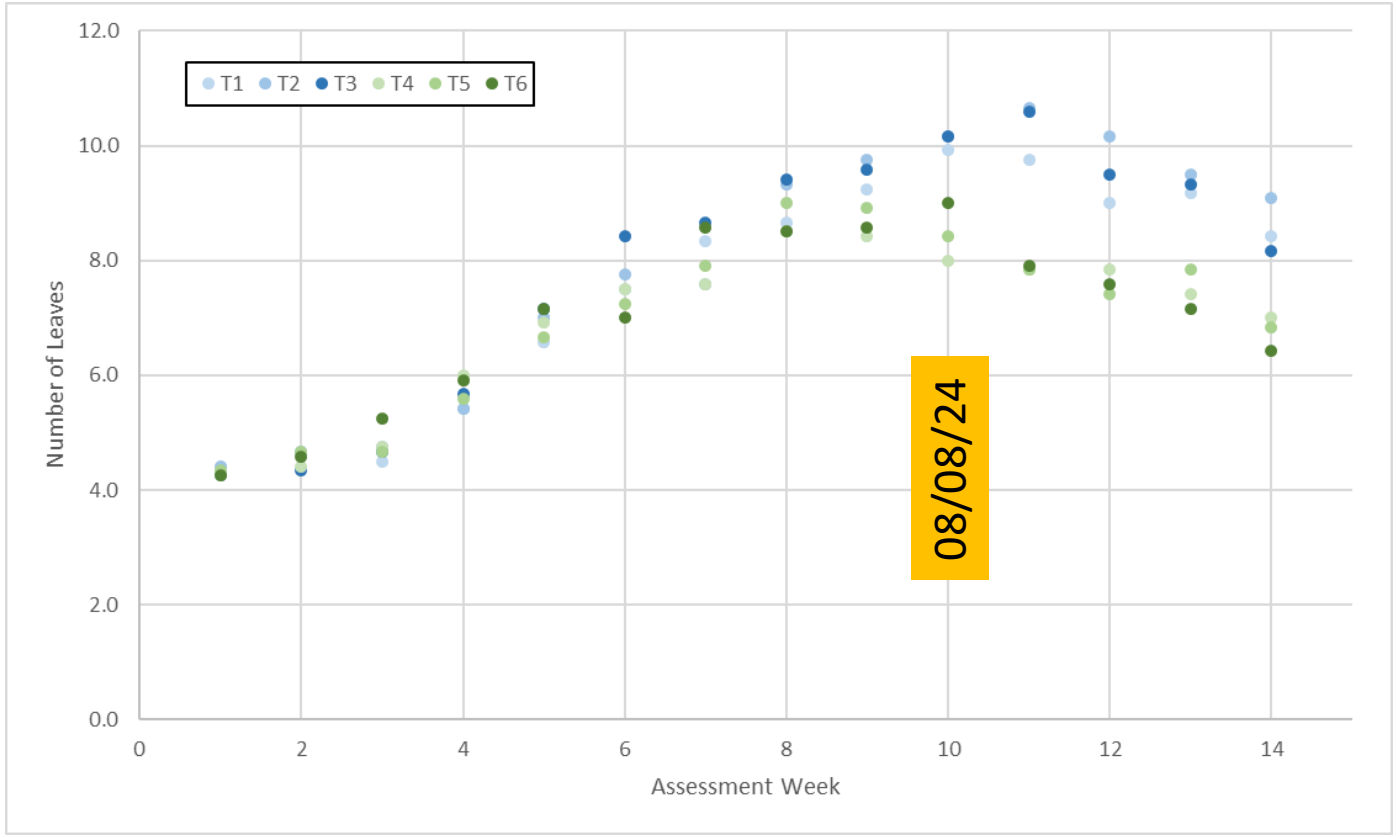
Planting depth treatment

Treatment #	Treatment
1	30 rhizomes/m^2; surface level (control)
2	30 rhizomes/m^2; planted 2.5cm below surface
3	30 rhizomes/m^2; planted 5.0cm below surface
4	100 rhizomes/m^2; surface level (control)
5	100 rhizomes/m^2; planted 2.5cm below surface
6	100 rhizomes/m^2; planted 5.0cm below surface

Trial Establishment – Irrigation & Drainage

Trial Establishment – Planting

Mean number of leaves per plant



Leaf numbers greater at lower planting density, from assessment week 10 onwards ($p<0.05$).

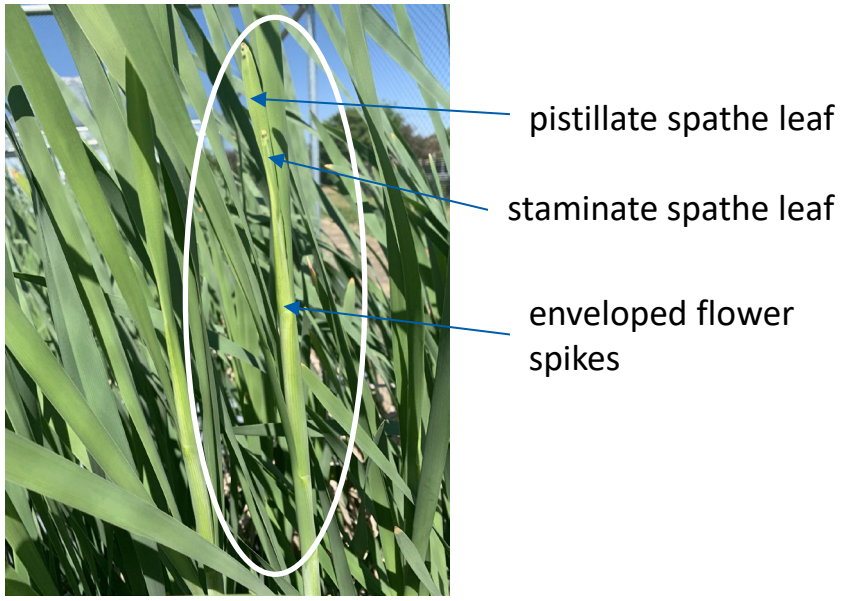
- Lower density treatments are shown as shades of blue; higher density treatments are shown as shades of green.
- Additionally (anecdotal):
  - Plants grown at 30 rhizomes/m^2 developed leaves which were twice the width of those grown at 100 rhizomes/m^2.
  - Plants grown at 100 rhizomes/m^2 developed taller leaves, relative to those grown at 30 rhizomes/m^2, in the first few weeks. Eventual leaf height was the same.

Year 1: Overwintering

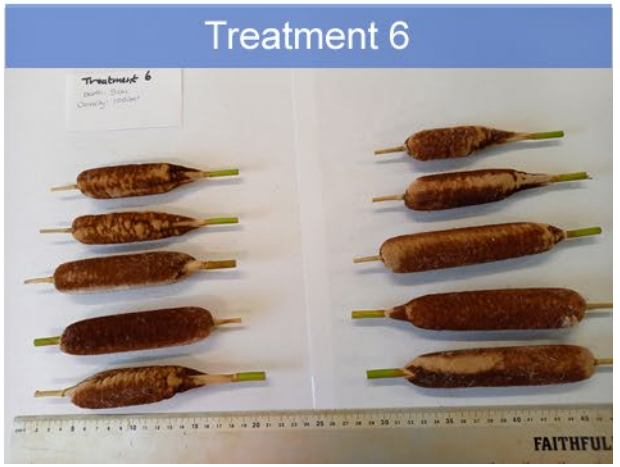
- Plants allowed to senesce in favour of resource translocation to rhizomes and roots
- Irrigation ceases, drainage holes blocked and containers flooded

Year 2: Regrowth

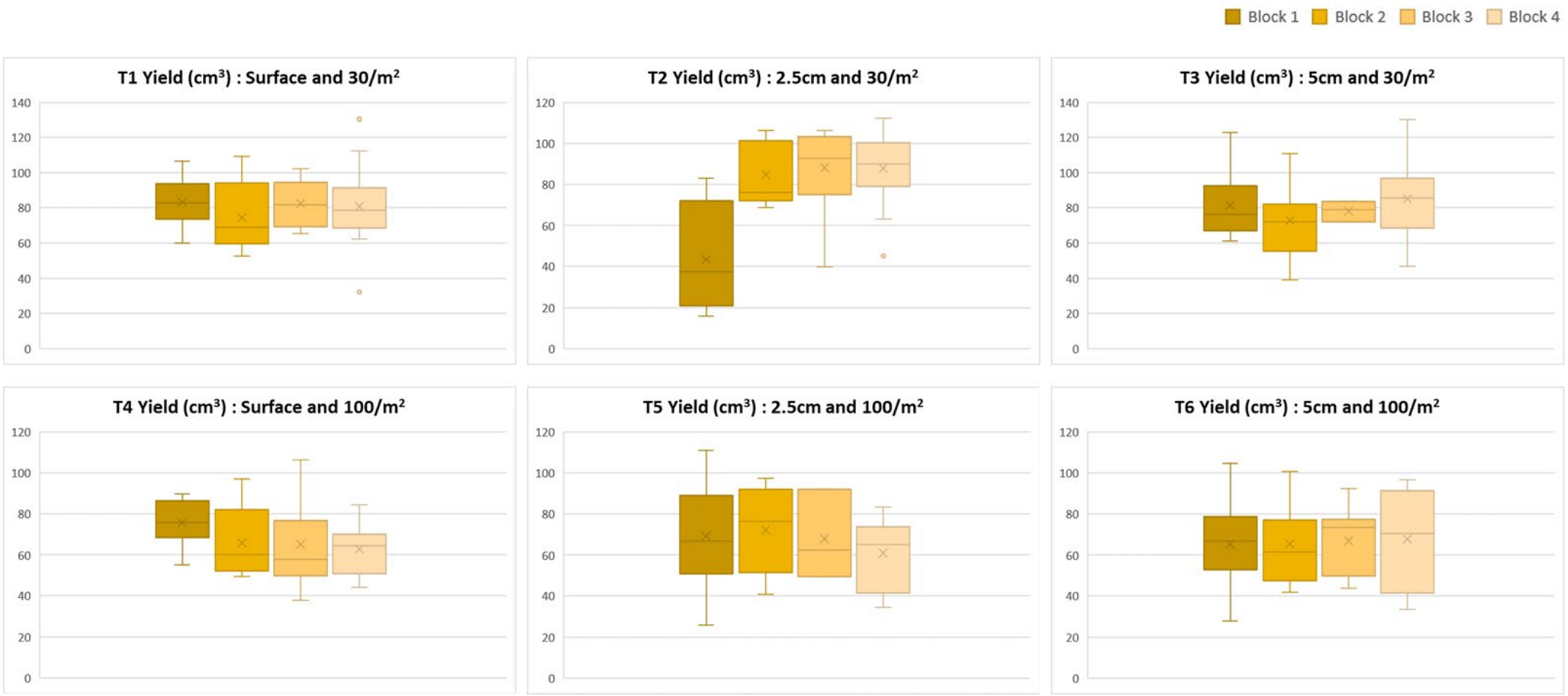
- On emergence of new shoots, drainage holes reinstated and irrigation commences (April 2025)
- Senesced leaf material remains
- First evidence of flowering in early May 2025
- Trial area sprayed with Protac SF on 18th June 2025
- Harvest occurred on 22nd September 2025



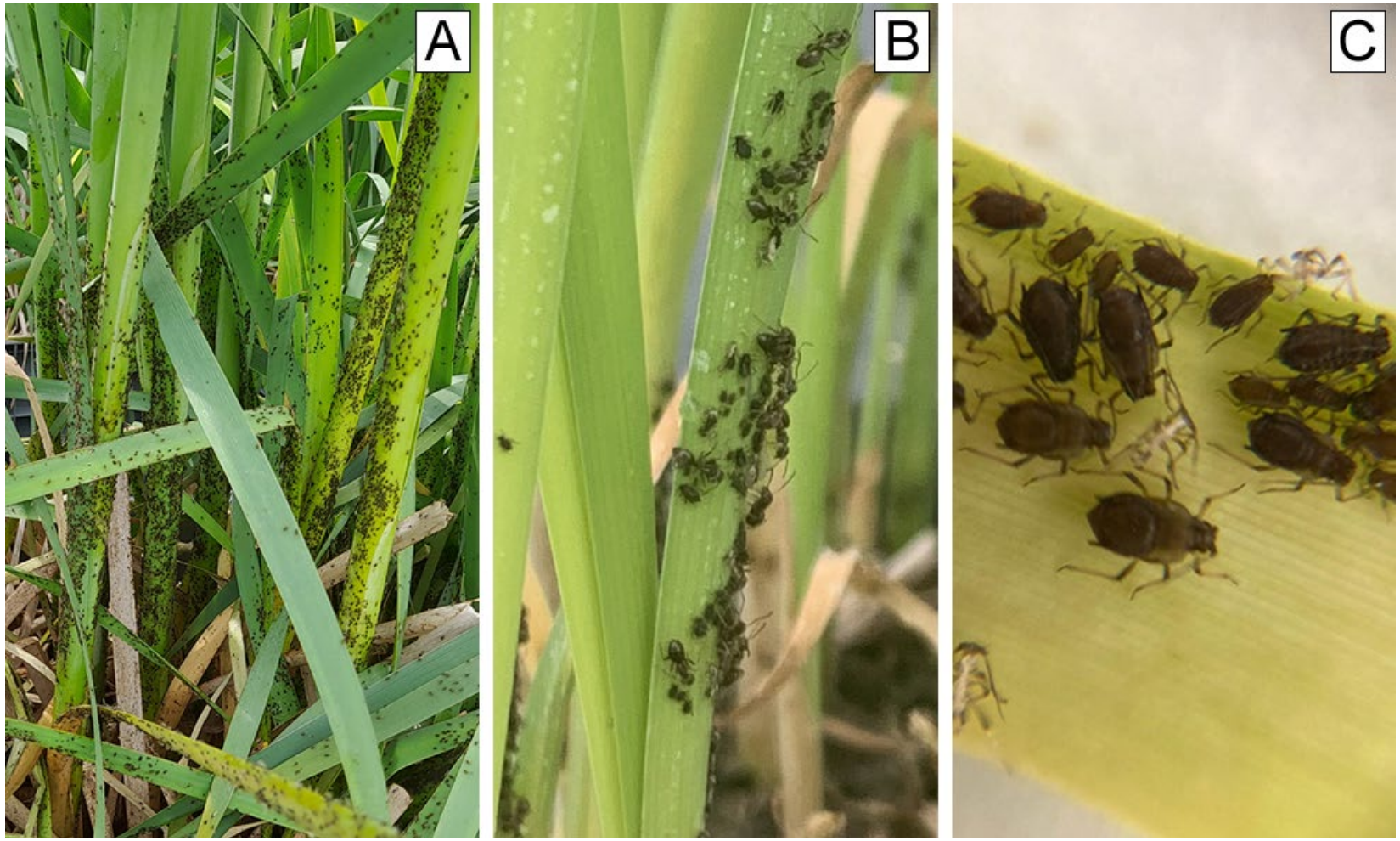
Representative sample of harvested seed heads by treatment



Volumetric yield per seed head by treatment and block



Bulrush Aphid (Schizaphis scirpi)



A: Infestation in trial crop;

B: Ants attending to colony;

C: Magnified image used for species identification.

Bulrush Cosmet Moth (Limnaecia phragmitella) & Other Moths

A: Early protrusion of seed head fibres caused by Limnaecia phragmitella larvae feeding;

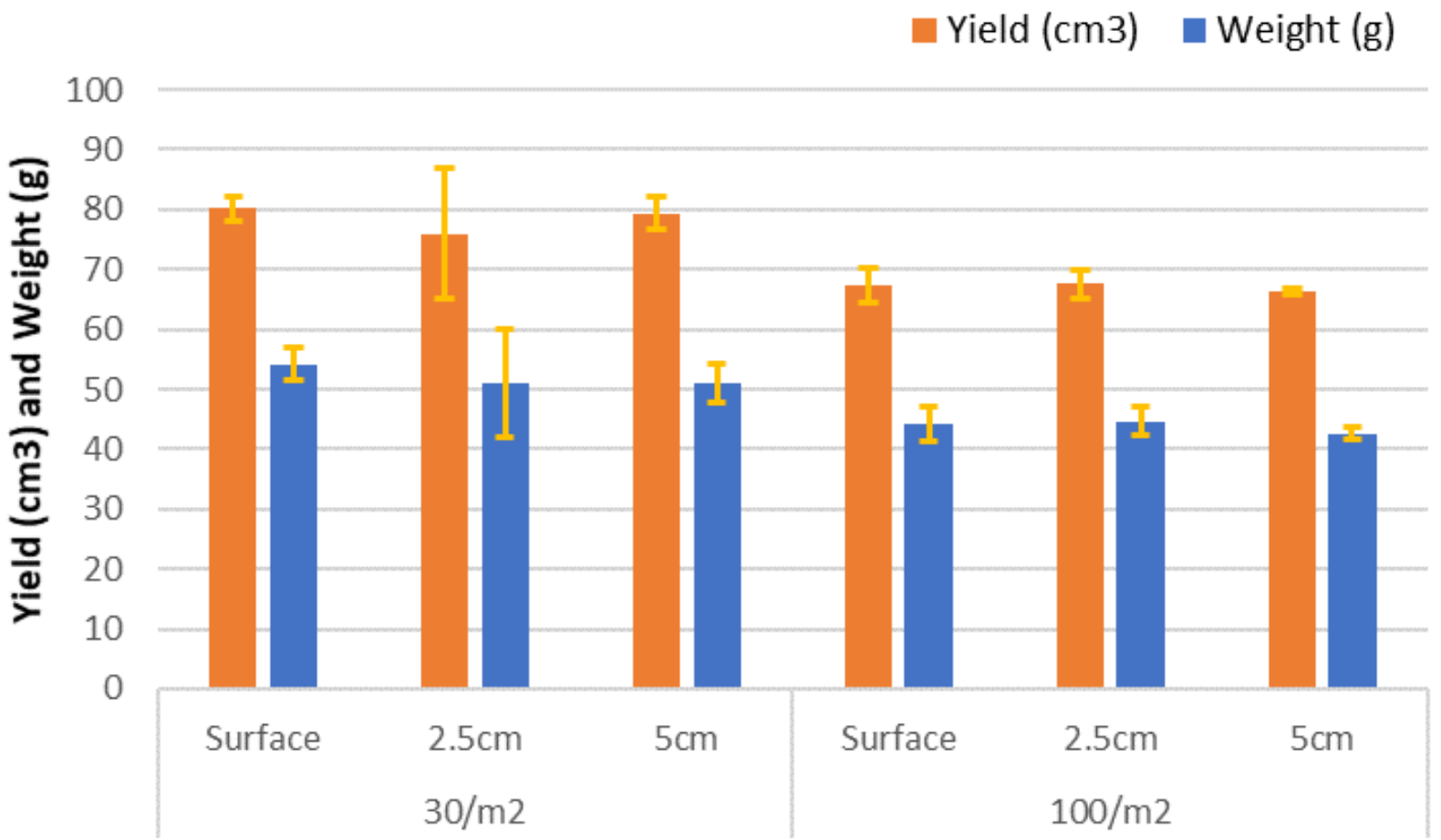
B: Longitudinal split in seed head caused by larvae of unidentified moth before pupation.

Other Moth Larvae

Bulrush Wainscot (*Nonagria typhae)*

Sources: UK Moths, Yorkshire Moths & Lepiforum

Volumetric yield and weight of individual seed heads by treatment



Conclusions

- Year 1: Floral induction did not occur, likely due to factors affecting rhizome maturity prior to establishment.
- Year 2: Flowering occurred across all treatments, with larger seed heads formed within treatments established at lower densities.

Water table/planting depth

- No significant differences ($p<0.05$), across both years.
- Expected that narrow range in the current planting depth treatments ensured floral induction across all treatments, but insufficient range to allow for differences to be observed between treatments.

Seed head numbers & sizes

- No significant differences were observed in seed head numbers as a result of planting density (**40 seed heads/m^2**)
- Differences were observed in overall sizes of seed heads (**80 cm^3** versus **65 cm^3**).
- The differences in volumetric yield suggest that flowers produced in the current year are borne on the parent ramets.

Rhizomes & Flowering

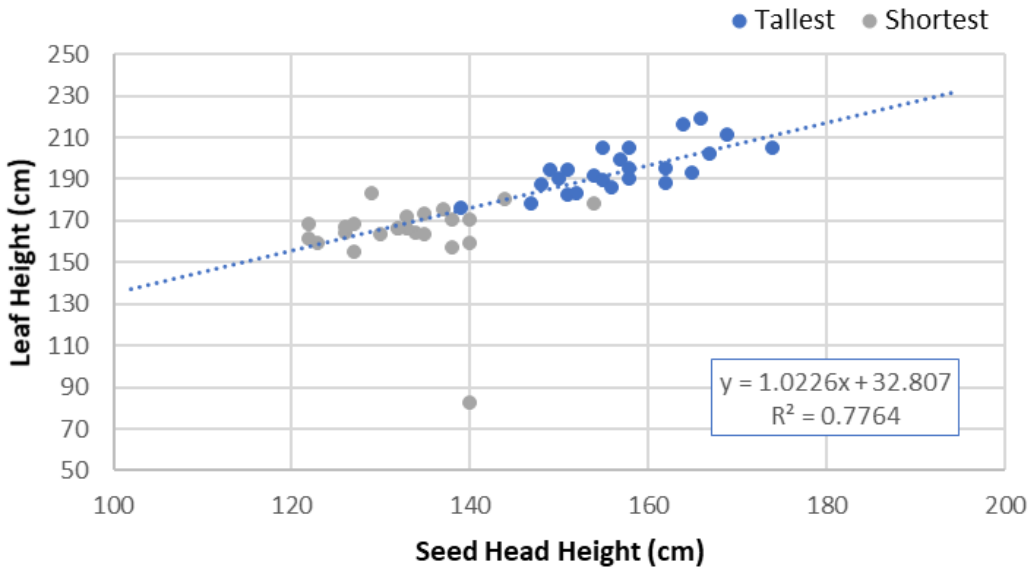
- Rhizomes planted in year 1, at the lower density, produced on average 2.5 laterals in the current year. Those planted at a higher density maintained their planted density.
- Next year, it is expected that vegetative laterals will have reached physiological maturity and will flower. Conversely, flowering shoots in the current year will be vegetative next year.

Further research

- Influence of last years' non-flowering on the proportion of generative to vegetative shoots can't be discounted.
- If the proportion of generative to vegetative shoots can be maintained at 50% for each, as in the current year, then there shouldn't be a risk of alternate bearing in subsequent years.
- It's not clear why higher density stand maintained density.

Additional

- Genetic diversity and crop nutrition may also contribute to resource allocation.
- Control of plant morphology, may be possible to encourage a uniform stand
- In the current year, there was a clear impact of pest pressure on seed head malformations and abortions. Robust plant protection methods need to be developed to maintain optimised yields, and ideally using sustainable integrated approaches.

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