NACIONĀLAIS ATTĪSTĪBAS PLĀNS 2020

EIROPAS SAVIENĪBA
Eiropas Reģionālās attīstības fonds

IEGULDĪJUMS TAVĀ NĀKOTNĒ

Īpaši pielāgotu LED gaismekļu izstrāde efektīva un energoefektīva kokaugu pavairošanas un apsakņošanas procesa nodrošināšanai

(līguma Nr. 1.1.1.1/18/A/138)

30.06.2022.

Stāstam par projekta mērķiem un sasniegtajiem rezultātiem:

No 2022. gada 20. jūnija līdz 23. jūnijam Lisabonas Universitātes Agronomijas fakultātē, Portugālē, norisinājās B4EST organizētā, starptautiskā zinātniskā konference "*Managing Forest Genetic Resources (FGR) for an Uncertain Future*" (https://b4est.eu/b4est-conference), kurā ar ziņojumu "*Morphological and physiological responses of hybrid aspen (Populus tremula L. × P. tremuloides Michx.) in vitro cultures to different light intensities*" tika prezentēti pētījuma rezultāti par dažādu LED apgaismojuma spektra un intensitāšu ietekmi uz apšu hibrīda mikrospraudeņu morfoloģiskajām un fizioloģiskajām īpašībām. Diskutēts par to kā samazinot apgaismojuma intensitāti apšu hibrīda kloni cenšas efektīvāk izmantot pieejamo gaismu un izrāda "*shade avoidance*" atbildes reakciju, ko iespējams izmantot, lai palielinātu pavairošanas spējas. Tāpat nedaudz iztirzātas klonu specifiskās reakcijas uz dažādiem redzamās gaismas spektra reģioniem. Klausītāji arī interesējās par to, kuras spektra daļas būtu nepieciešamas, lai nodrošinātu optimālāko apšu hibrīda klonu augšanu.

Konferencē piedalījās zinātniskās institūcijas un pētnieki no visas Eiropas un tā norisinājās kā B4EST (pilnais projekta nosaukums "*Adaptive BREEDING for productive, sustainable and resilient FORESTs under climate change*") gala sanāksme, attiecīgi konferences mērķis bija pakārtots projekta mērķim – nodot iesaistītajām pusēm zināšanas, kā uzlabot mežaudžu izdzīvotību, produktivitāti, noturību pret slimībām klimata izmaiņu ietekmē, tai pat laikā ievērojot

ES izvirzītos “zaļā kursa” mērķus. Konferencē prezentēti ziņojumi par dažādiem tematiem: ģenētisko metožu izmantošanu selekcijas procesa optimizēšanai; klimata modeļu izmantošanu un attiecīgu selekcijas programmu atbilstošu pielāgošanu; selekcijas rezultātu pārnesi uz stādaudzētavām un mežaudzēm; selekcijas rezultātu ieviešanas politiskajiem aspektiem.

Konferences prezentācija pielikumā.

Morphological and physiological responses of hybrid aspen (*Populus tremula* L. x *P. tremuloides* Michx.) *in vitro* cultures to different light intensities

NATIONAL DEVELOPMENT PLAN 2020

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INVESTING IN YOUR FUTURE

Toms Kondratovičs
Mārtiņš Zeps
toms.kondratovics@silava.lv

European Regional Development Fund project (Nr. 1.1.1.1/18/A/138)

Context

- Use of productive, fast growing taxa.
- *In vitro* as means for higher propagation rates and faster breeding process.
- Light as energy source and signal.
- LED luminaires – energy-efficient with adjustable spectral composition and intensity.
- Light effect on growth of hybrid aspen *in vitro* is rarely studied.

Materials and Methods

- Established ~5 year old *in vitro* cultures of four hybrid aspen clones.
- LED luminaires with three spectral compositions and fluorescent lamps as control
- Each spectral composition tested at 30, 70 and 110 $\mu mol \cdot m^{2} \cdot s^{-1}$ intensity.
- Morphological (stem and leaf), SPAD and chlorophyll fluorescence variables were determined after 4 weeks

Materials and Methods

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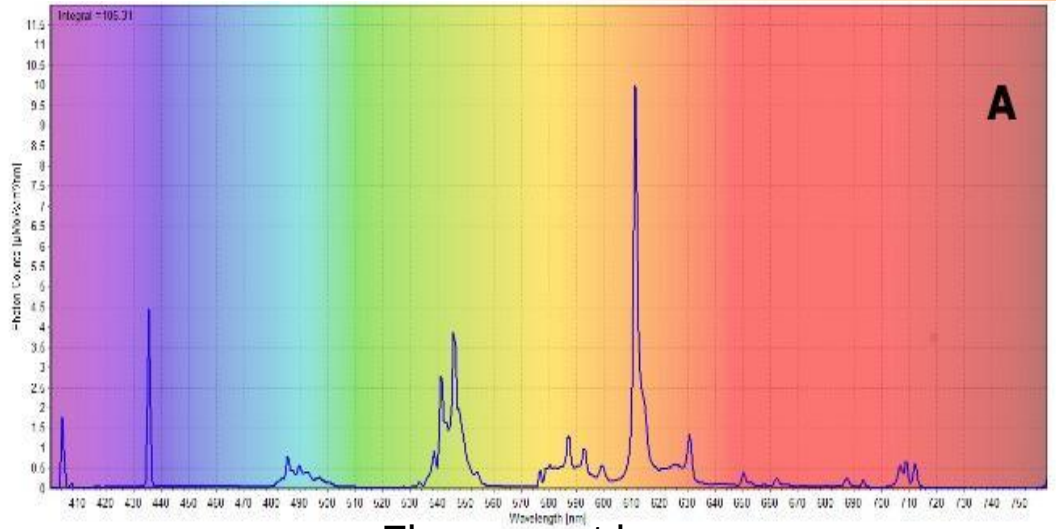
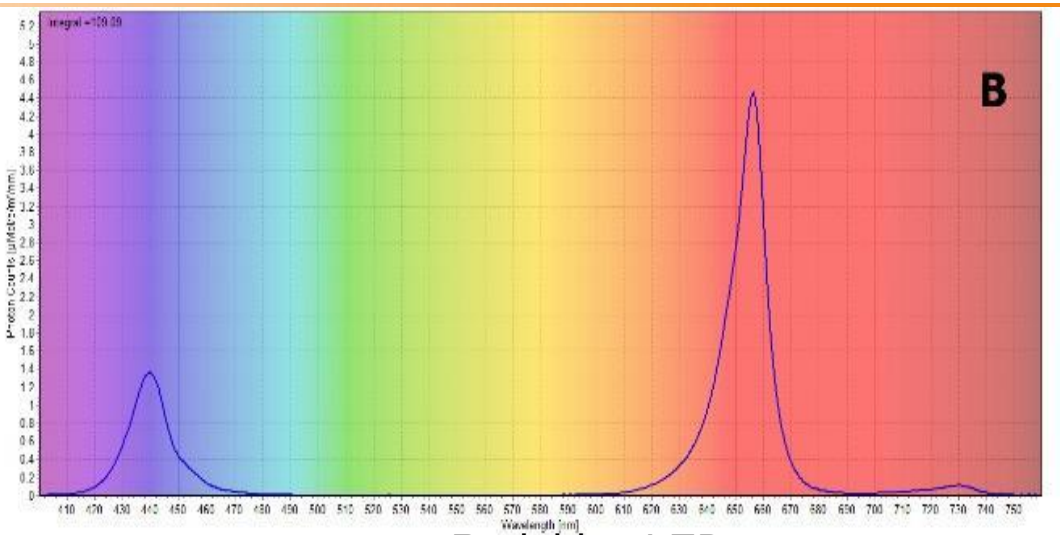
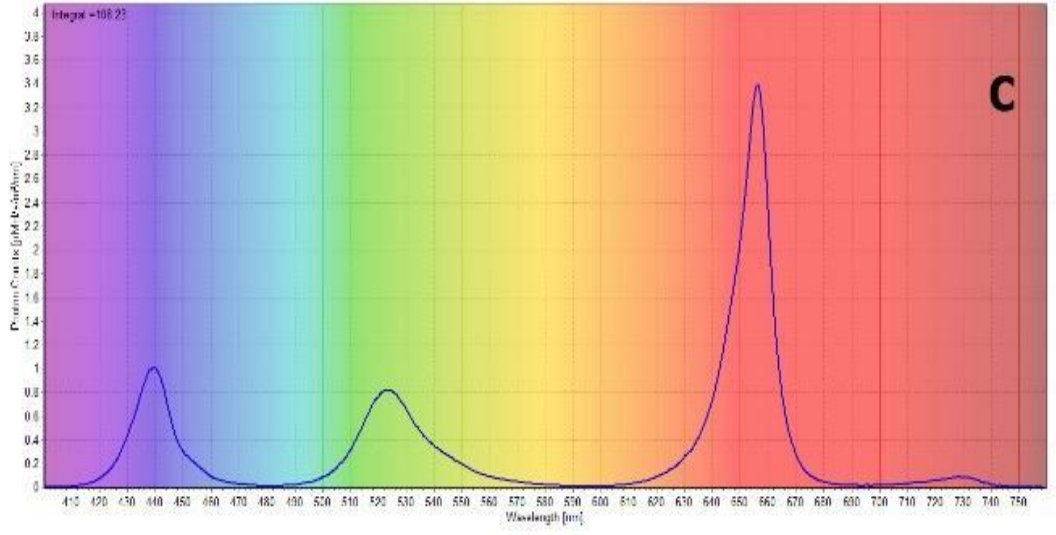


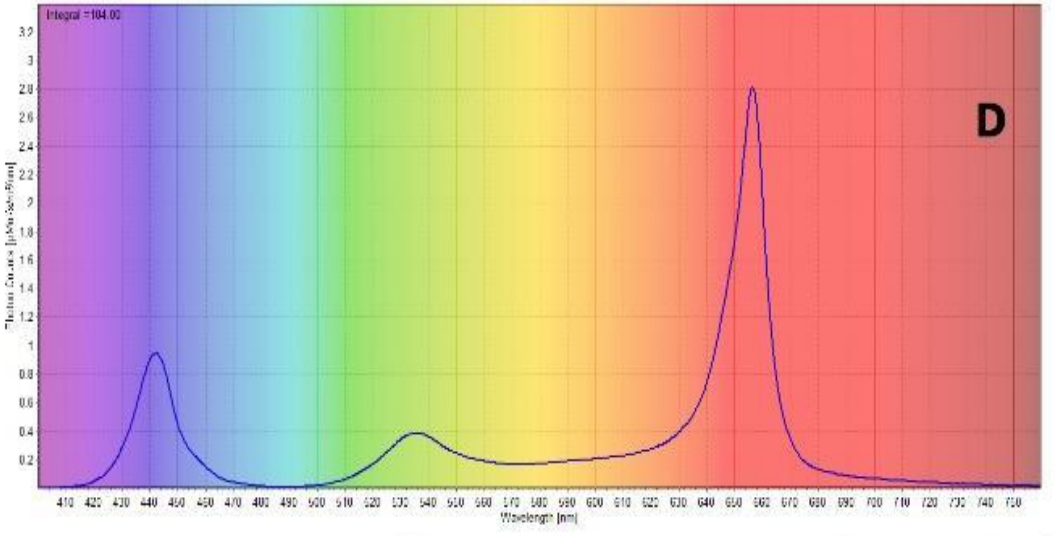
Fluorescent lamp



Red, blue LED



Red, green, blue LED



Red, green, blue, yellow, orange LED

Materials and Methods

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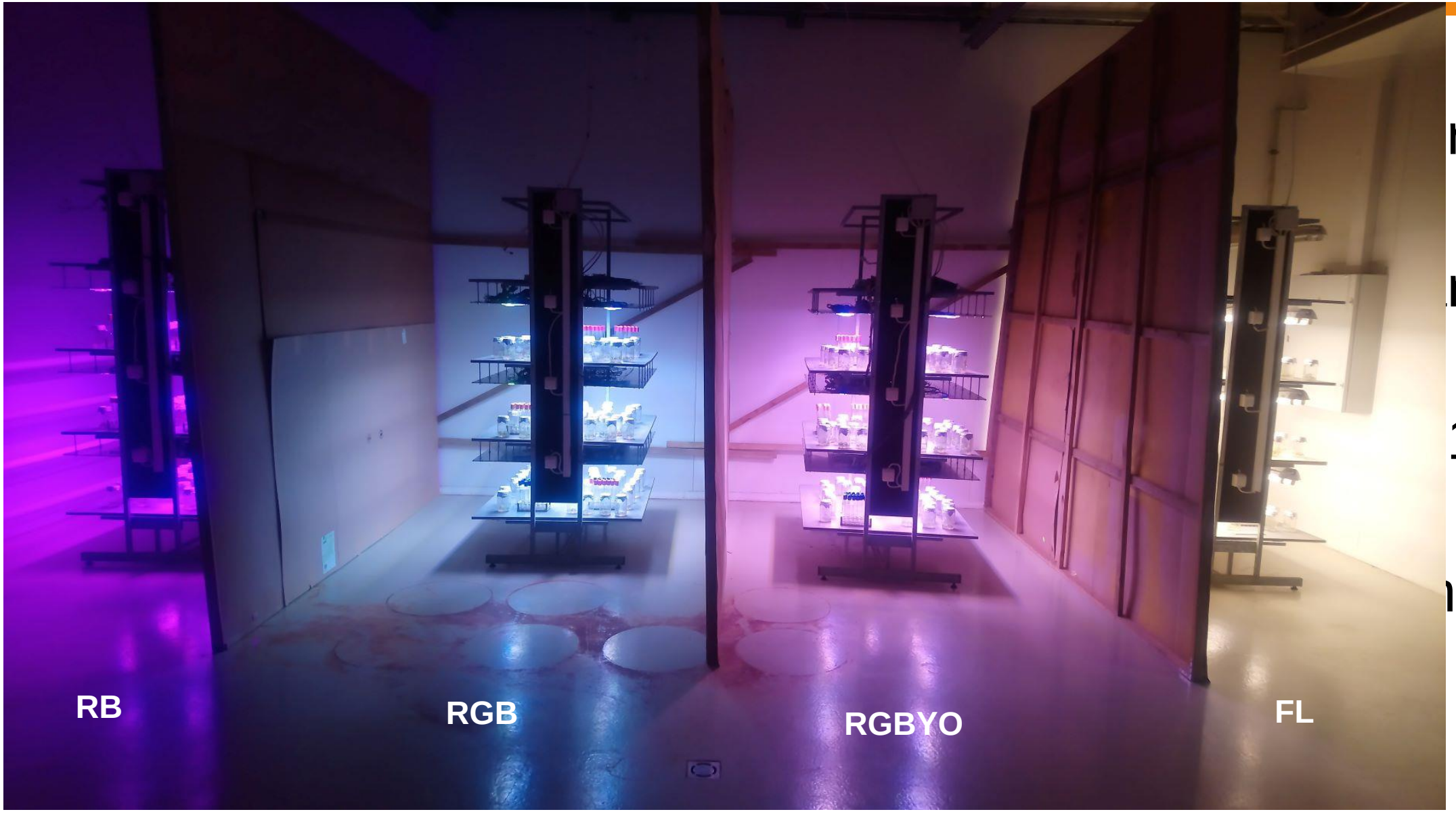
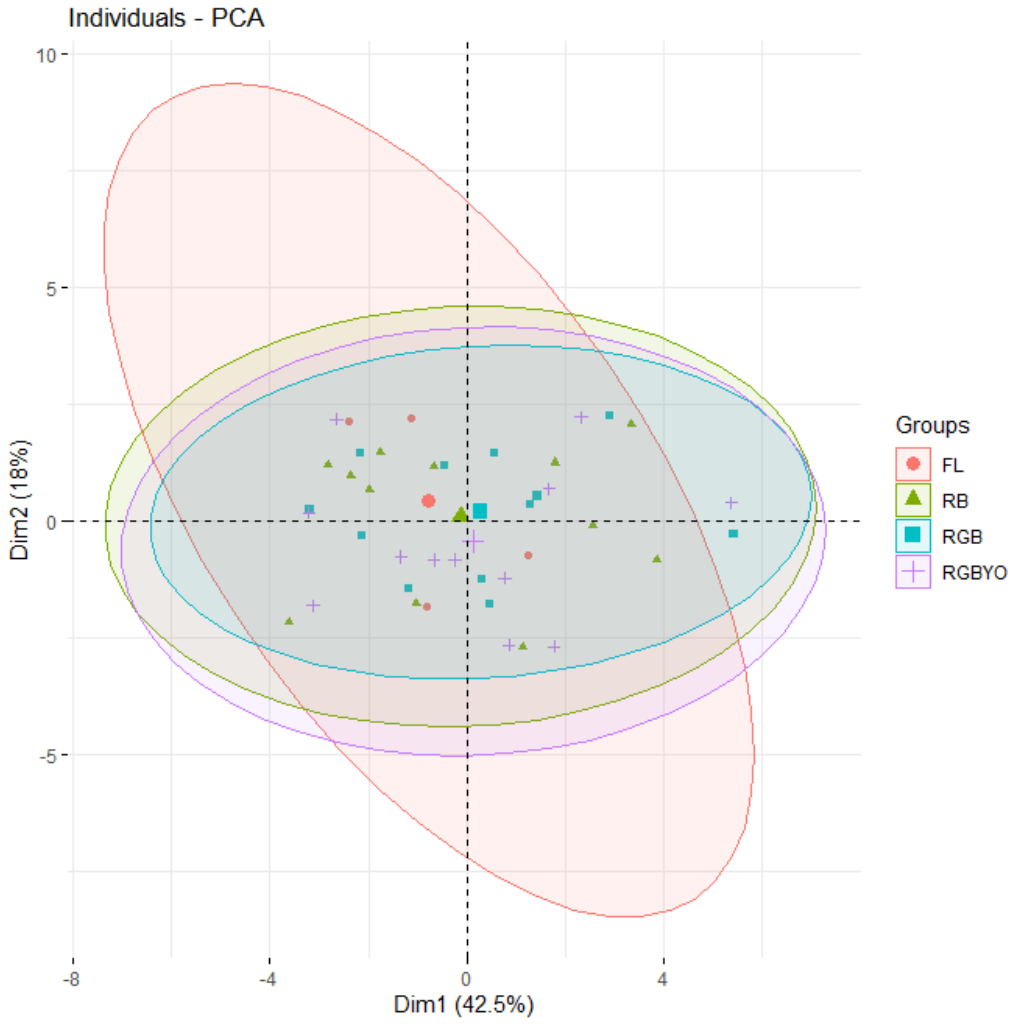
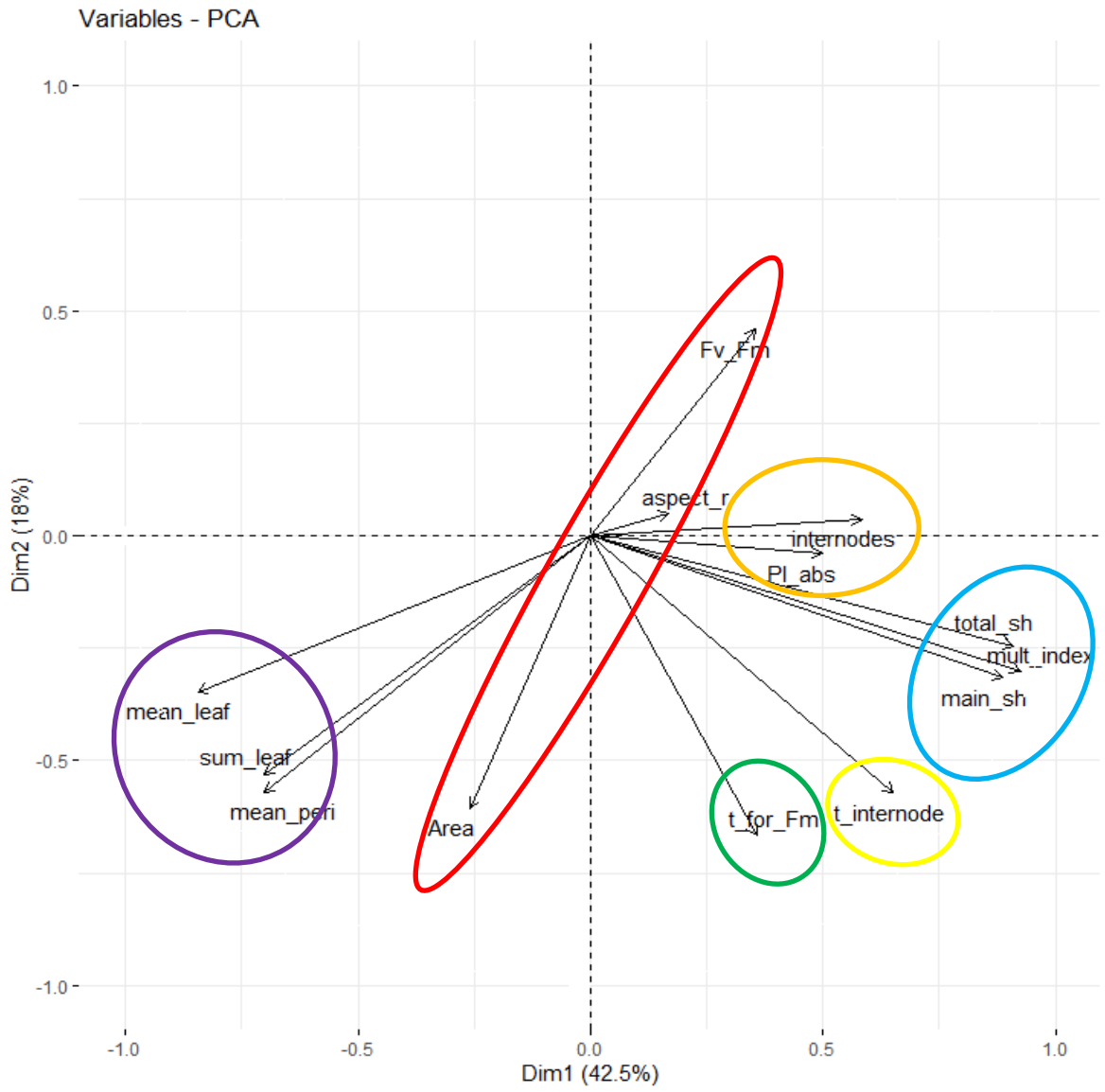


Results



- Different responses to intensities
- Similar responses to spectral composition

Results



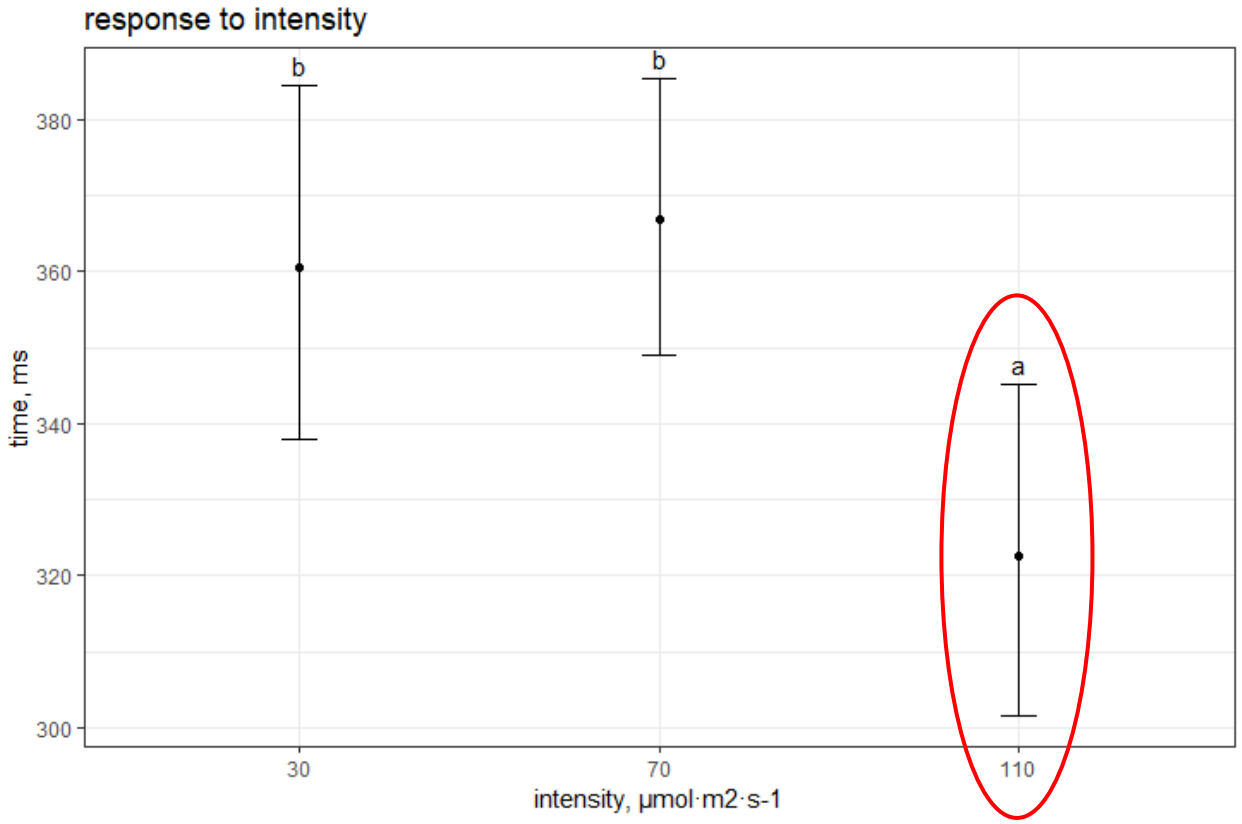
- T for Fm
- Fv/Fm
- PI_{abs}
- Total shoot length
- Third internode
- Mean leaf area

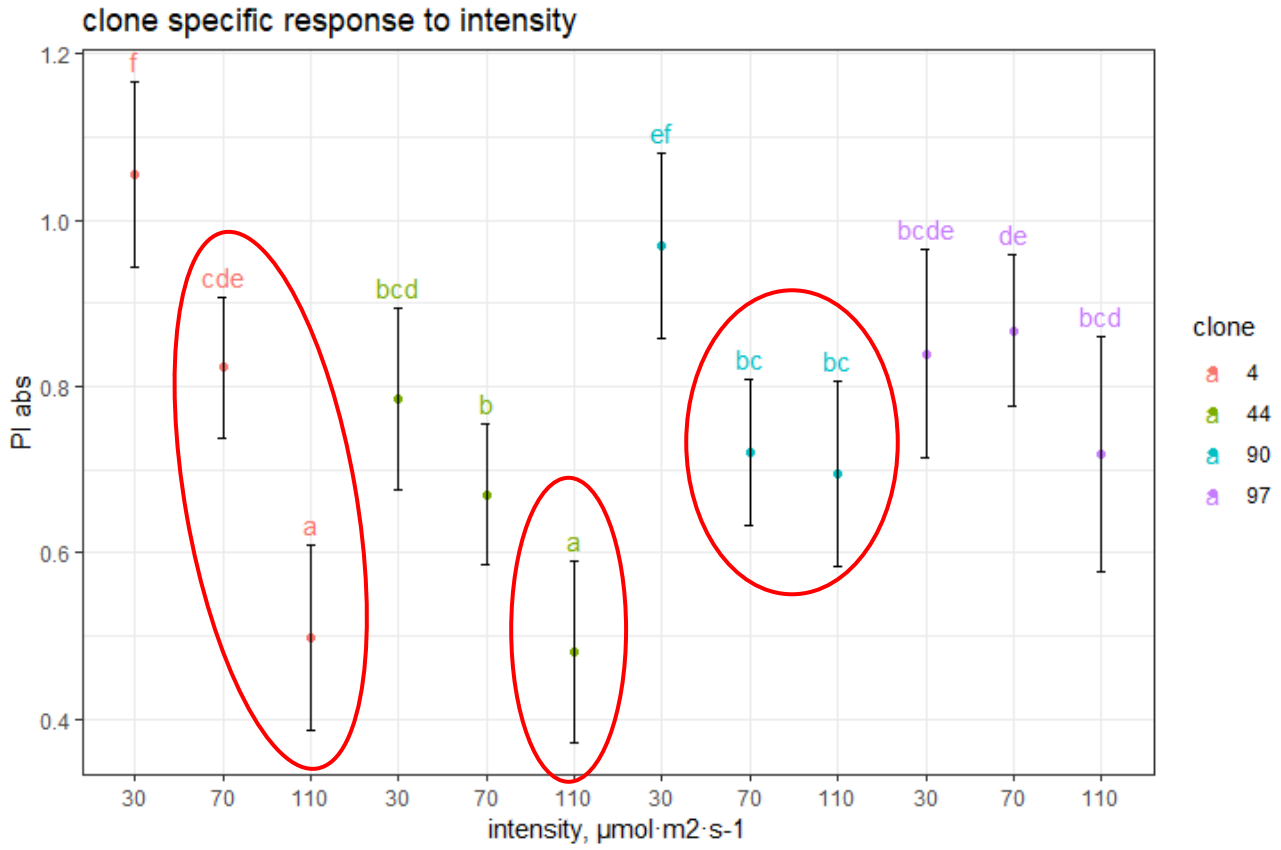
Results

F values

	clone	spectrum	intensity	interaction clone:spectrum	interaction intensity:clone
t_for_Fm	26.32***	8.28***	8.21***	2.45**	0.63
Fv_Fm	4.83**	0.31	29.87***	2.62**	6.70***
PI_abs	11.36***	4.27**	64.54***	3.78***	7.73***
SPAD	25.22***	6.18***	54.87***	2.47*	3.28*
mean_leaf	39.58***	2.64*	44.77***	2.27*	1.62
t_internode	34.48***	6.13***	78.77***	5.18***	3.61**
total_shoot	45.27***	2.97*	91.78***	2.19*	3.02**

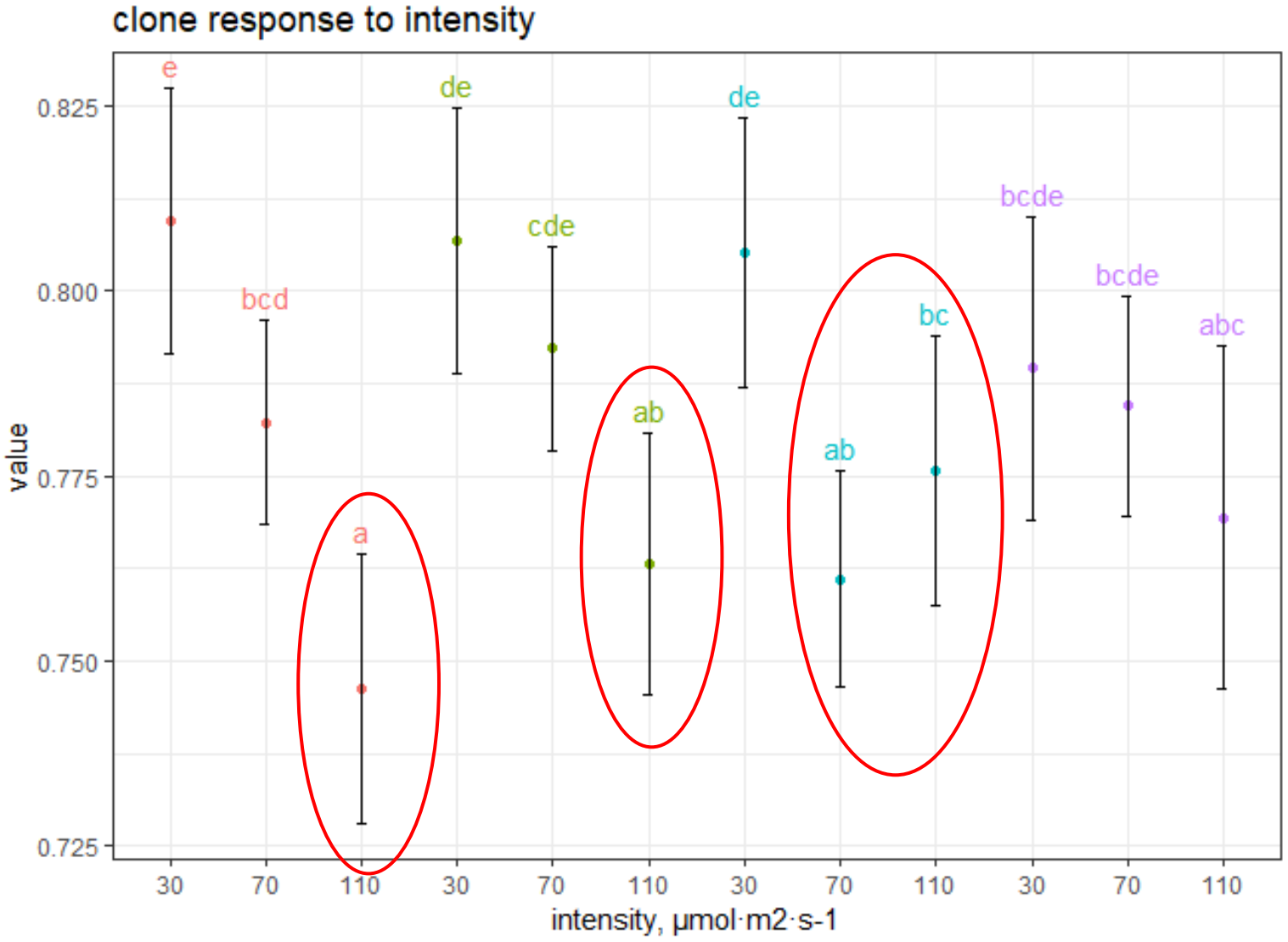
Performance index and t for Fm





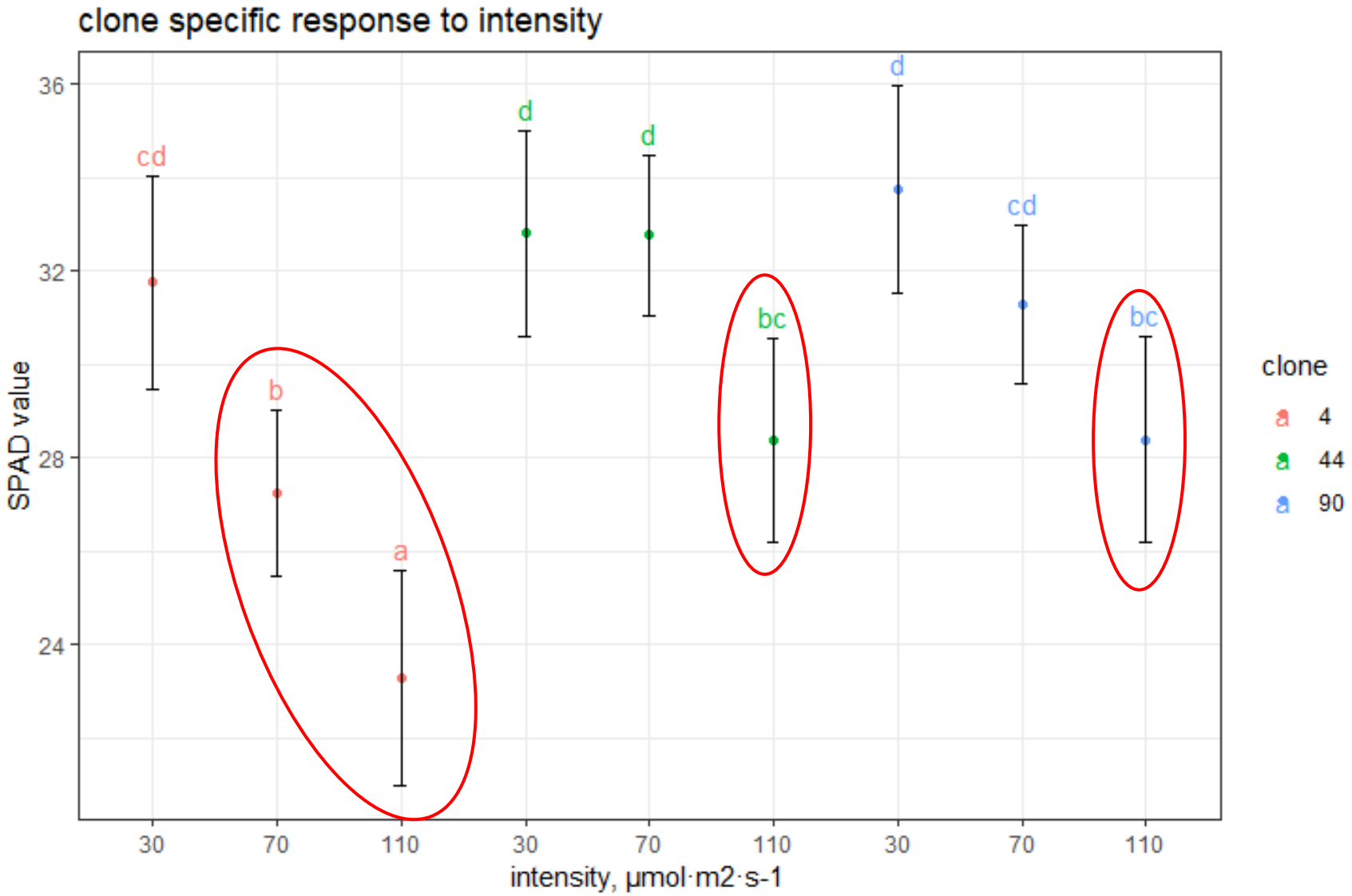
- Faster kinetics and reduced overall vitality under increased intensity

Fv/Fm



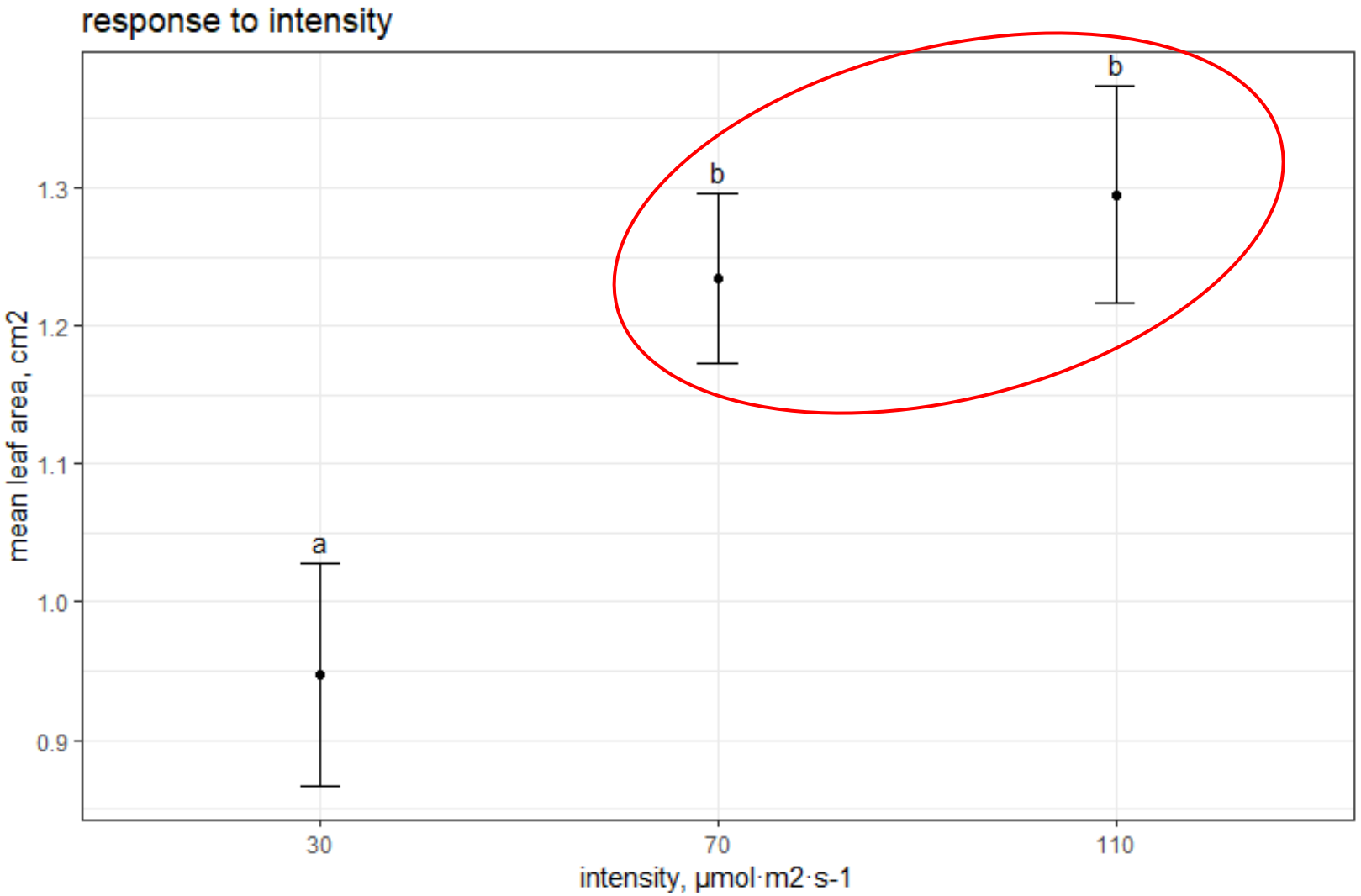
- Reduced PSII efficiency (quantum absorption) under higher intensities

SPAD



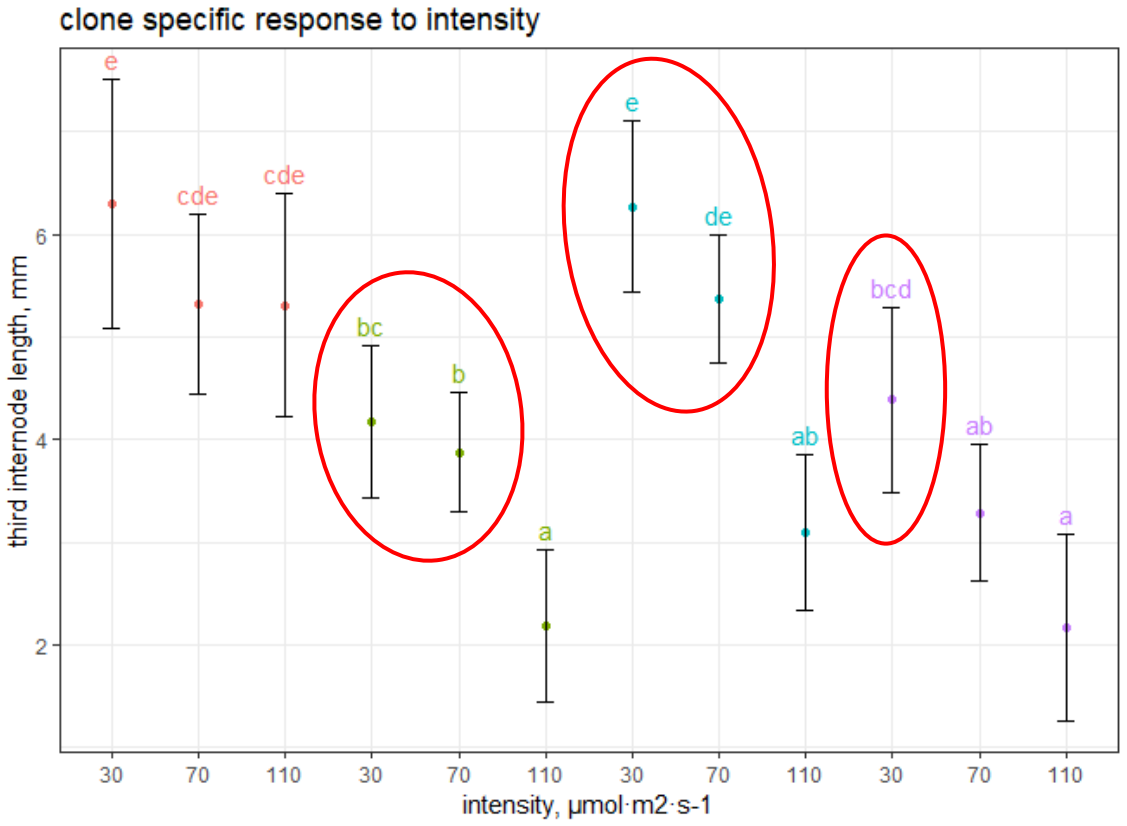
- Lower relative chlorophyll content with increasing intensity

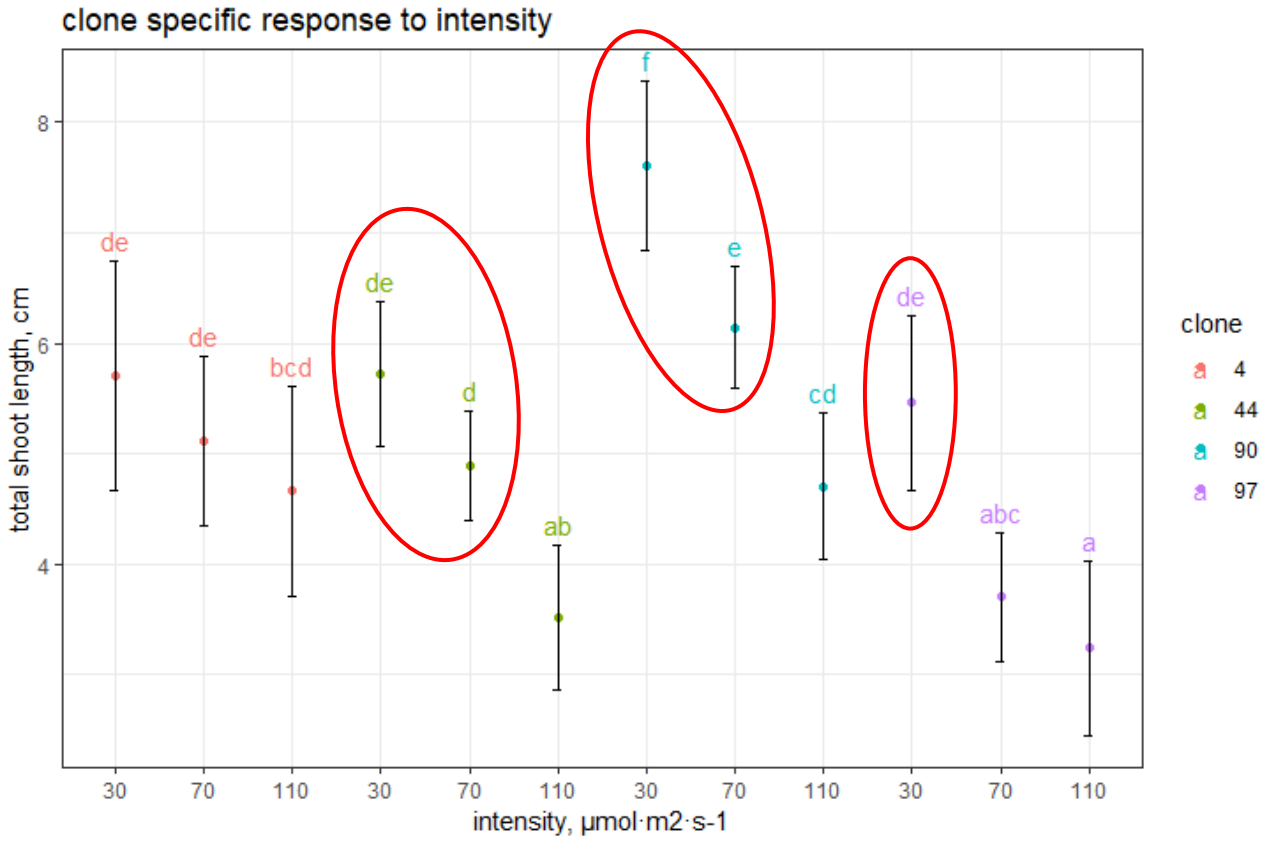
Mean leaf area



- Higher intensities promote formation of larger leaves

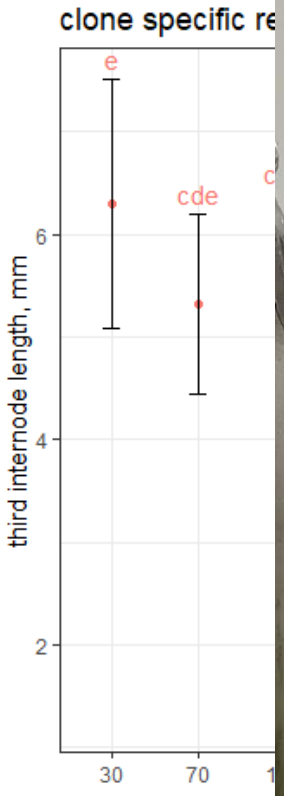
Third internode, total shoot length

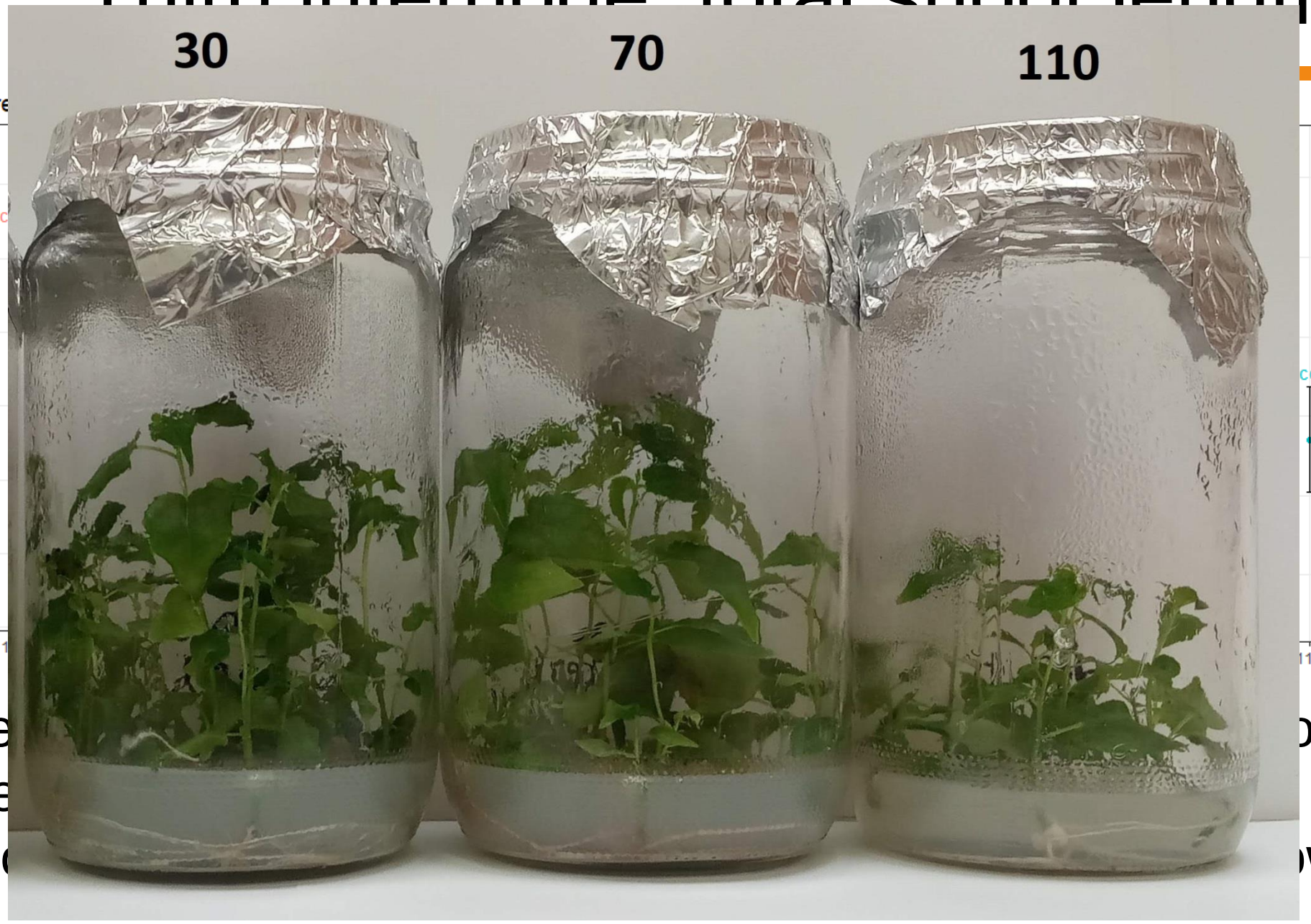


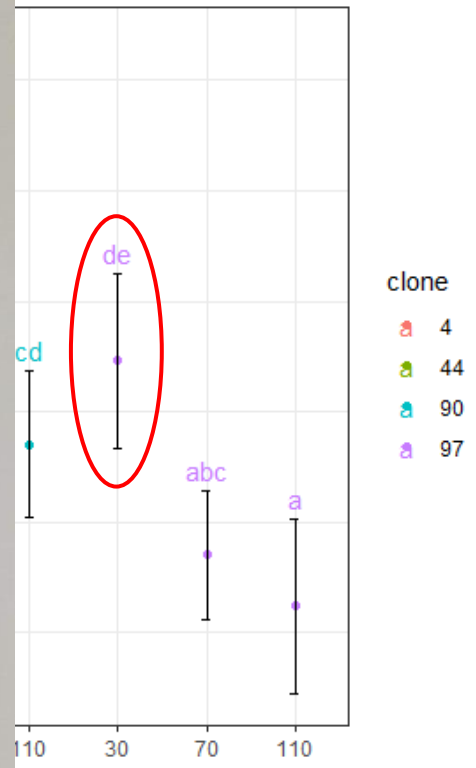


- Lower intensities promote formation of longer internodes, consequently, longer shoots
- Necrotic shoot tips due to loss of apical dominance under low intensities

Third internode, total shoot length





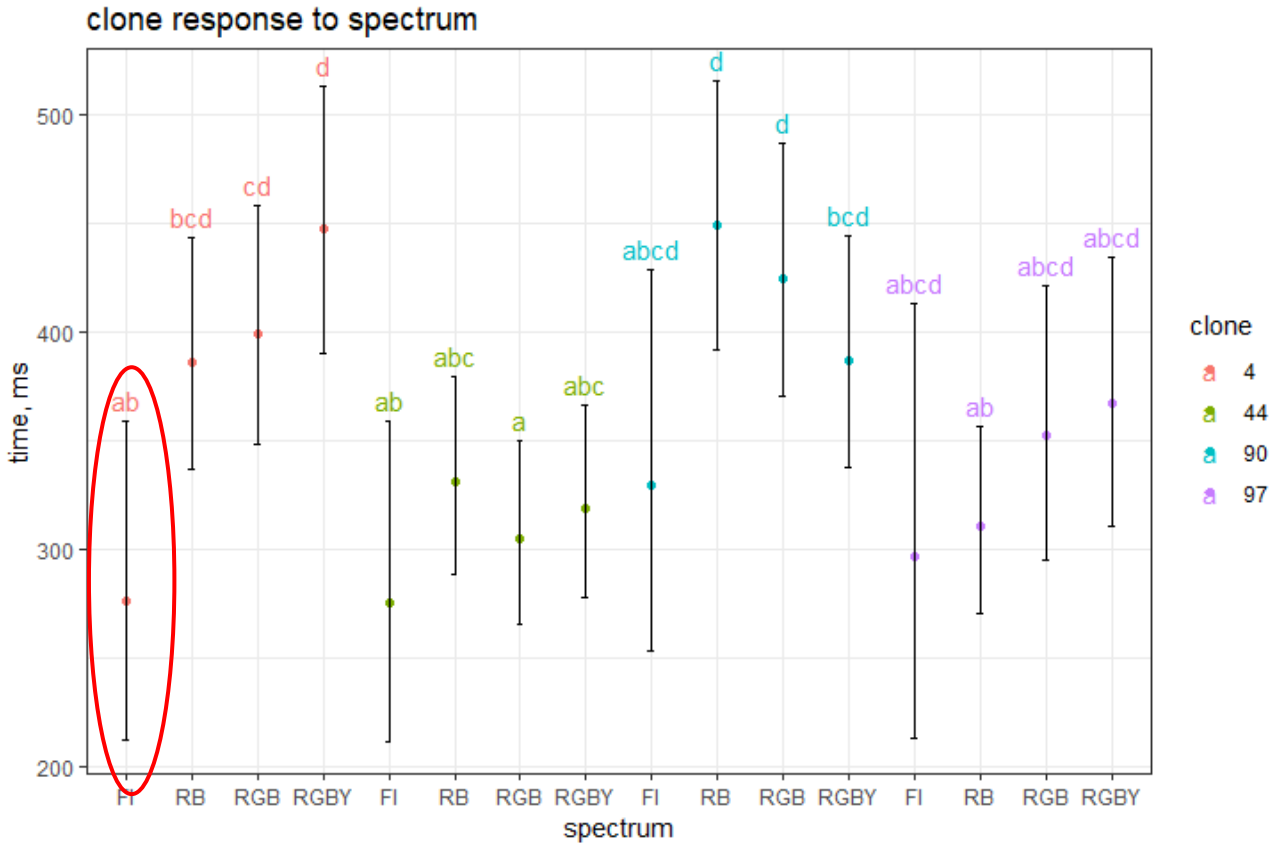


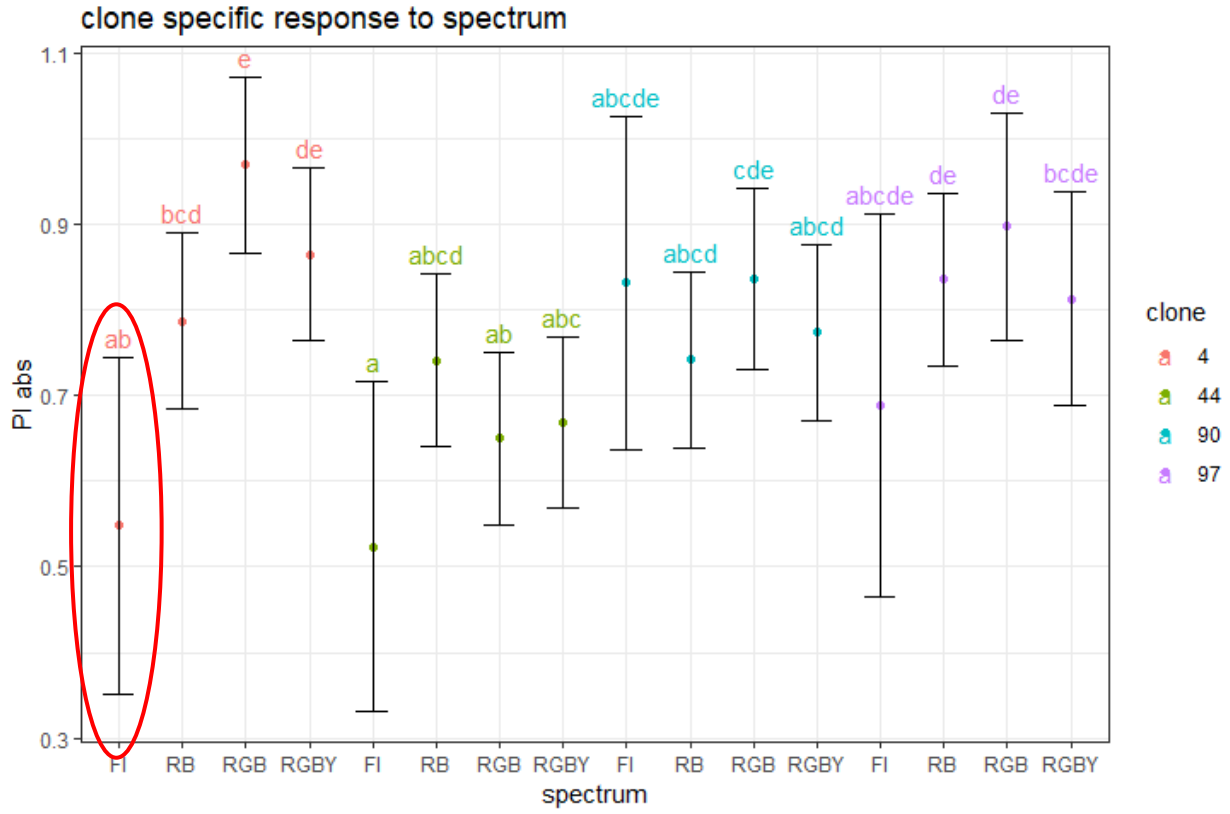
- Lowe onsequently, longe
- Necr w intensities

Summary

- Lower intensities induce “shade avoidance”
- Higher PSII efficiency, investing in shoot growth
- Combined approach - 30 and 70 µmol intensity

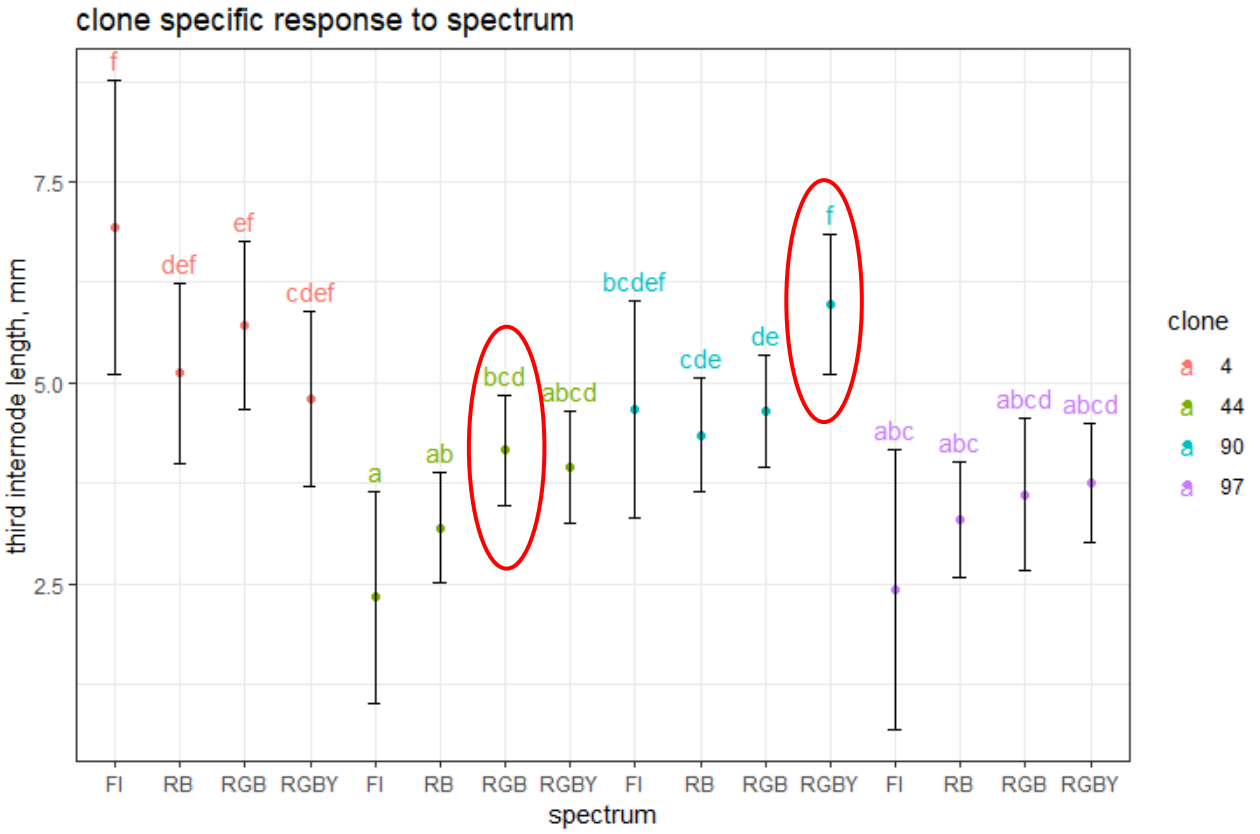
Performance index and t for Fm

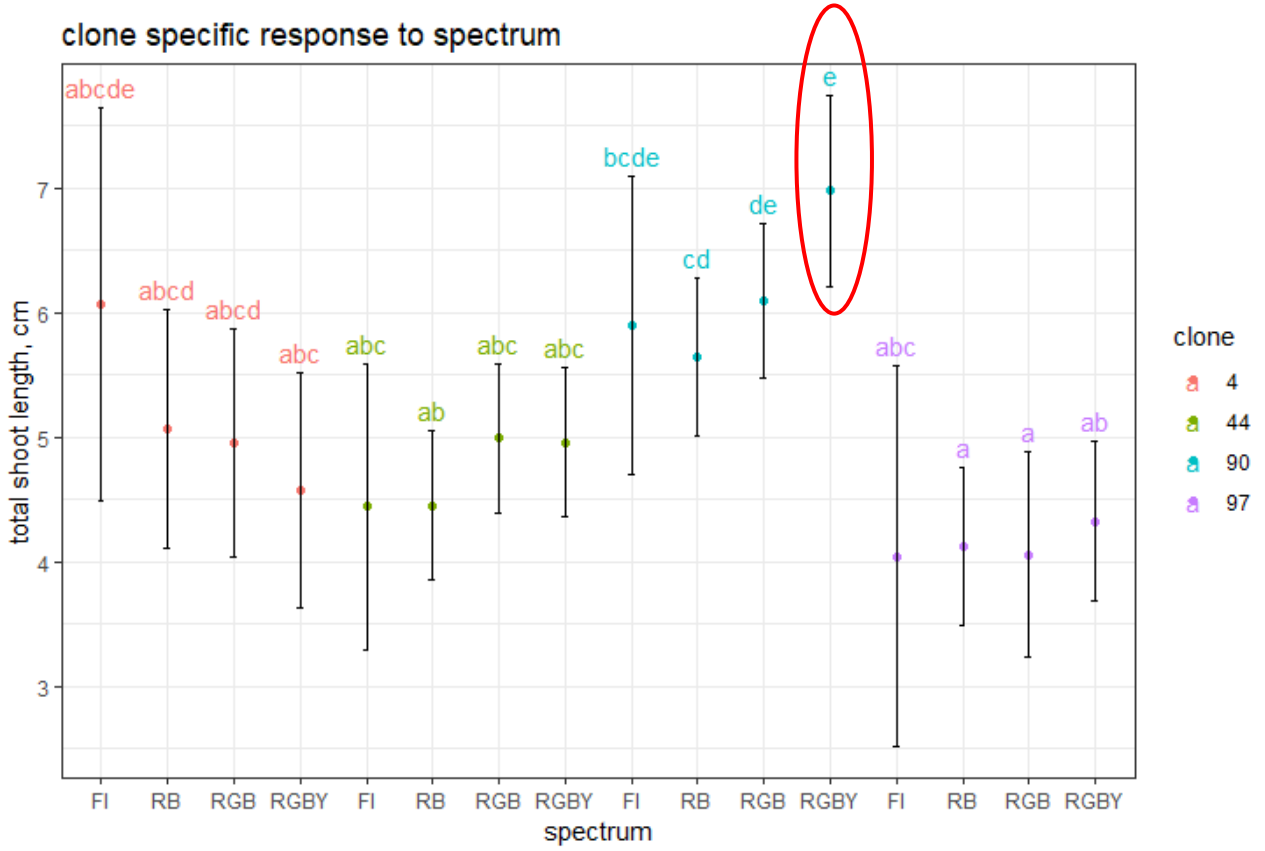




- Faster fluorescence kinetics and reduced overall plant vitality in response to reduced red light amount

Third internode, total shoot length





Summary

- Lower intensities induce “shade avoidance”
- Higher PSII efficiency, investing in shoot growth
- Combined approach - 30 and 70 µmol intensity
- Luminaires with full spectrum and sufficient red light amount
- LED properties promote use of these luminaires

Thank you!

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