

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



EUROPEAN UNION

European Regional
Development Fund

INVESTING IN YOUR FUTURE

Toms Kondratovičs

Mārtiņš Zeps

toms.kondratovics@silava.lv

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.

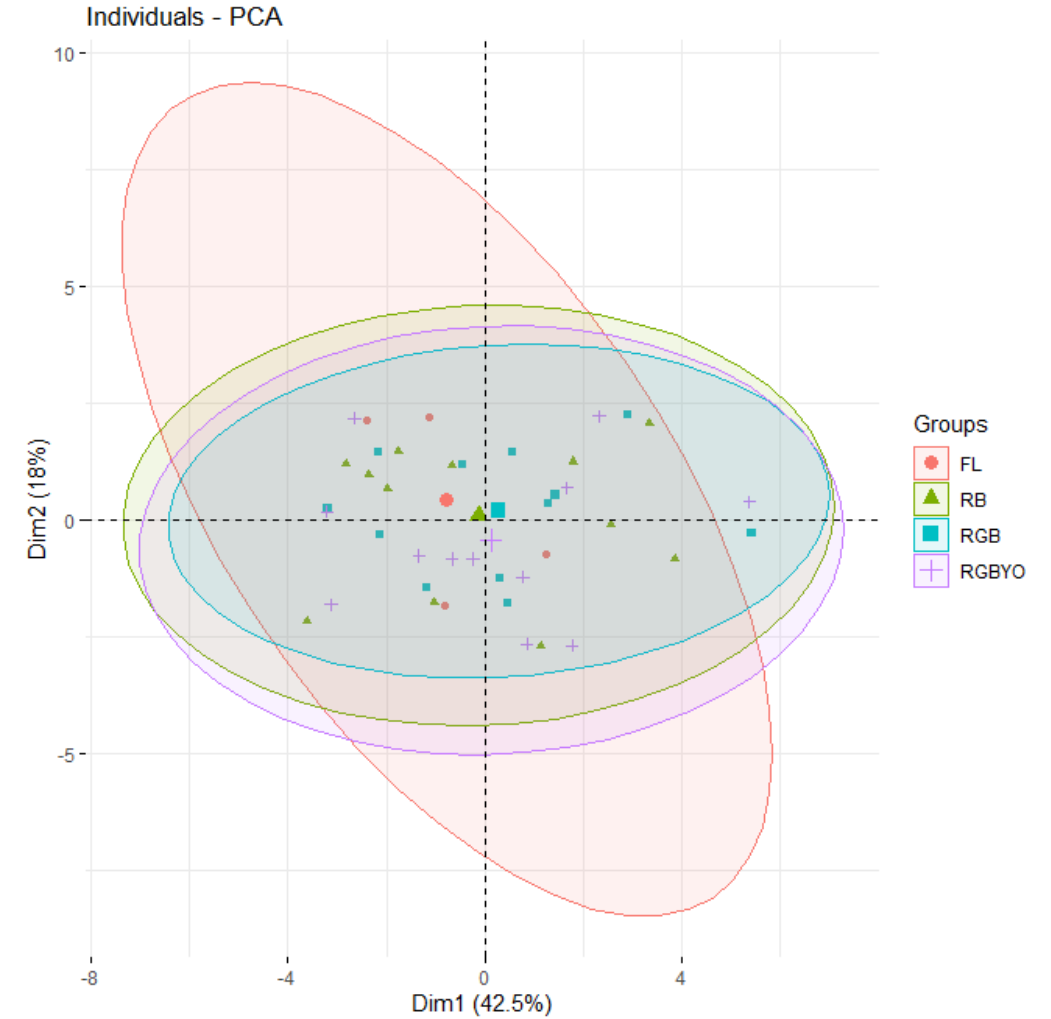
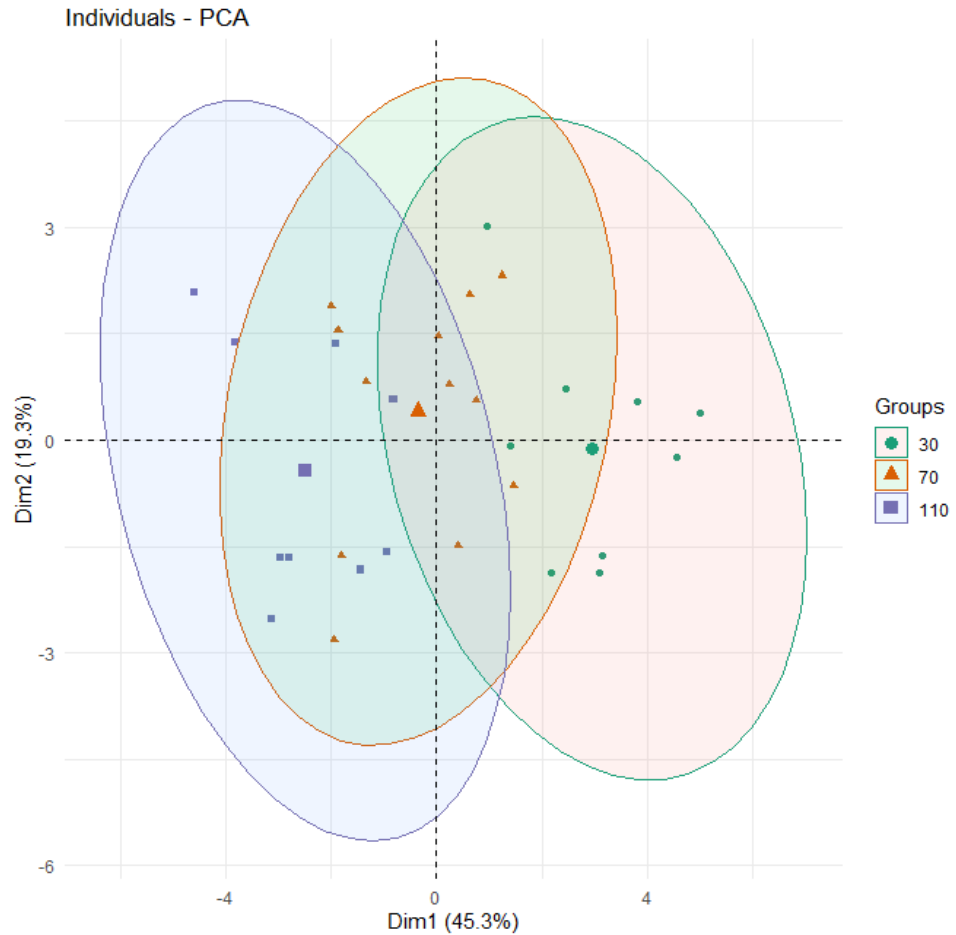
Materials and Methods



-
-
-
-

d
d
0
11

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

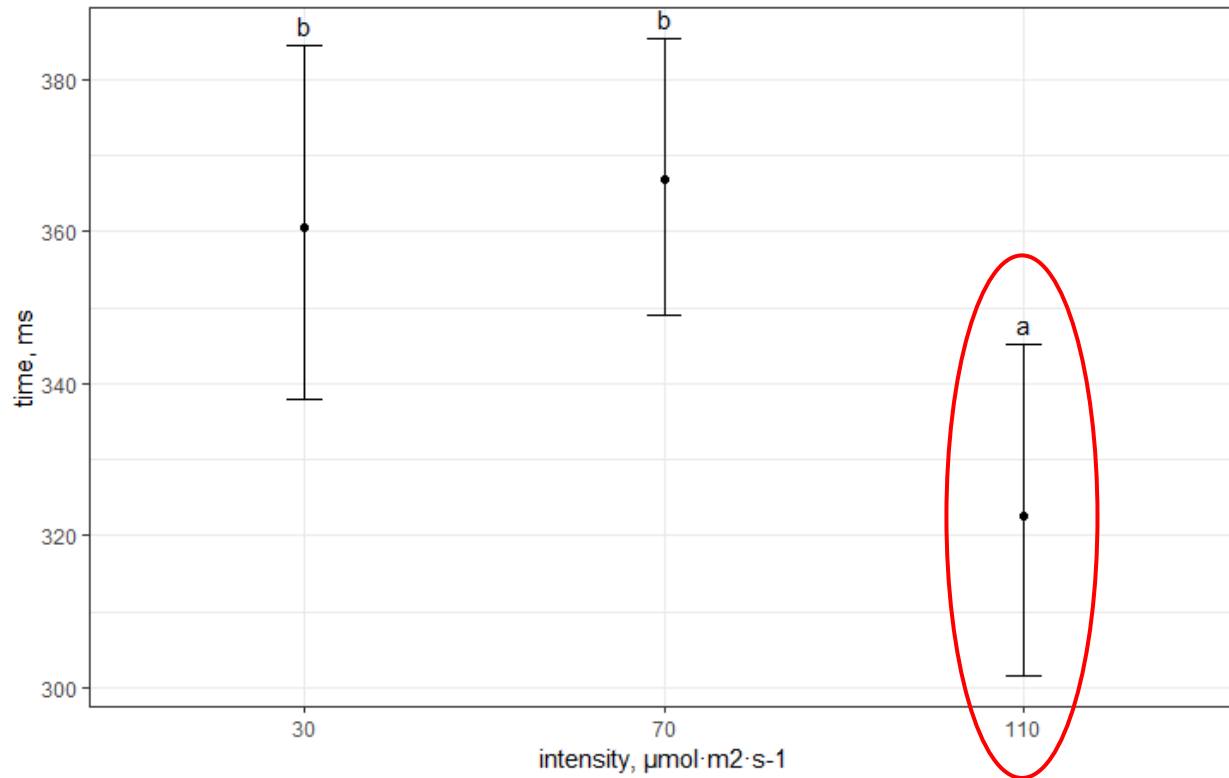


F values

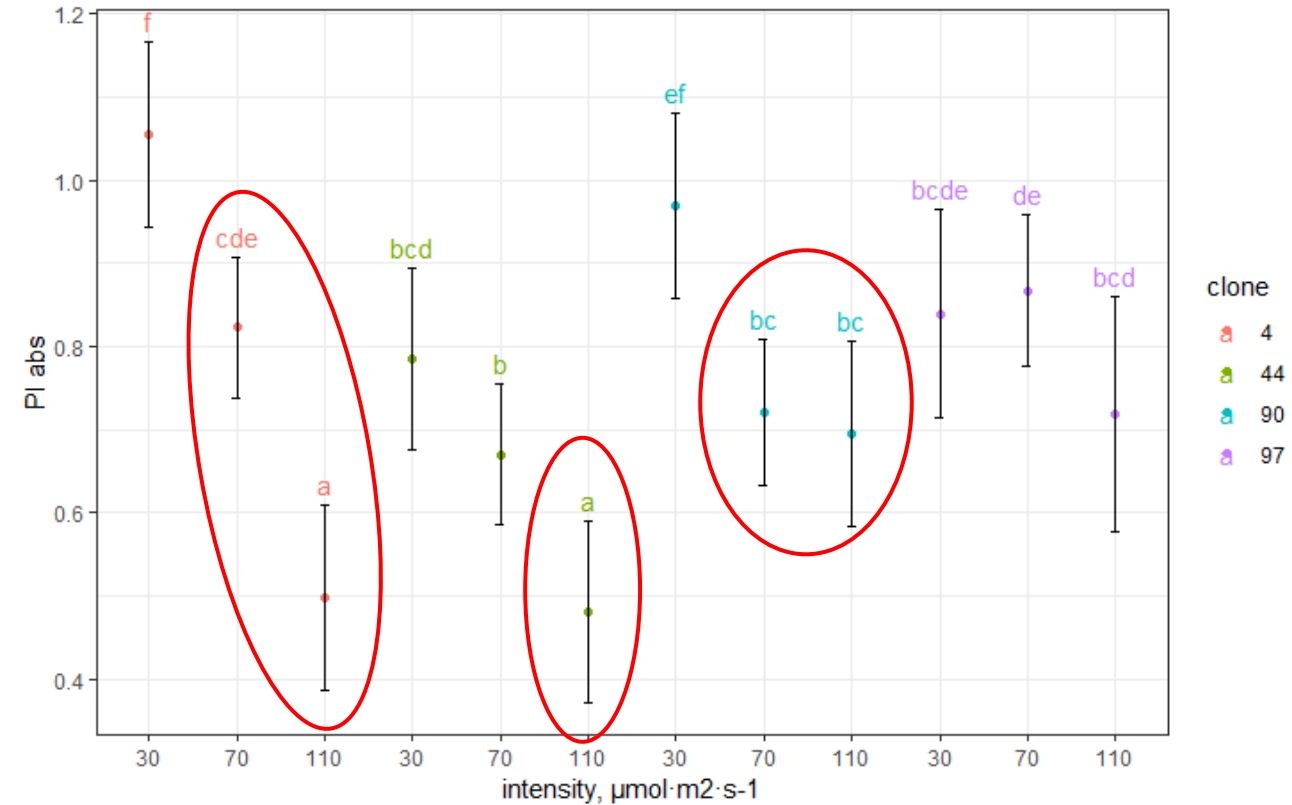
	clone	spectrum	intensity	interaction clone:spectrum	interaction intensity:clone
t_for_Fm	26.32***	8.28***	8.21***	2.45**	0.63
Fv_Fm	4.83**	0.31	29.87***	2.62**	6.70***
PI_abs	11.36***	4.27**	64.54***	3.78***	7.73***
SPAD	25.22***	6.18***	54.87***	2.47*	3.28*
mean_leaf	39.58***	2.64*	44.77***	2.27*	1.62
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

response to intensity



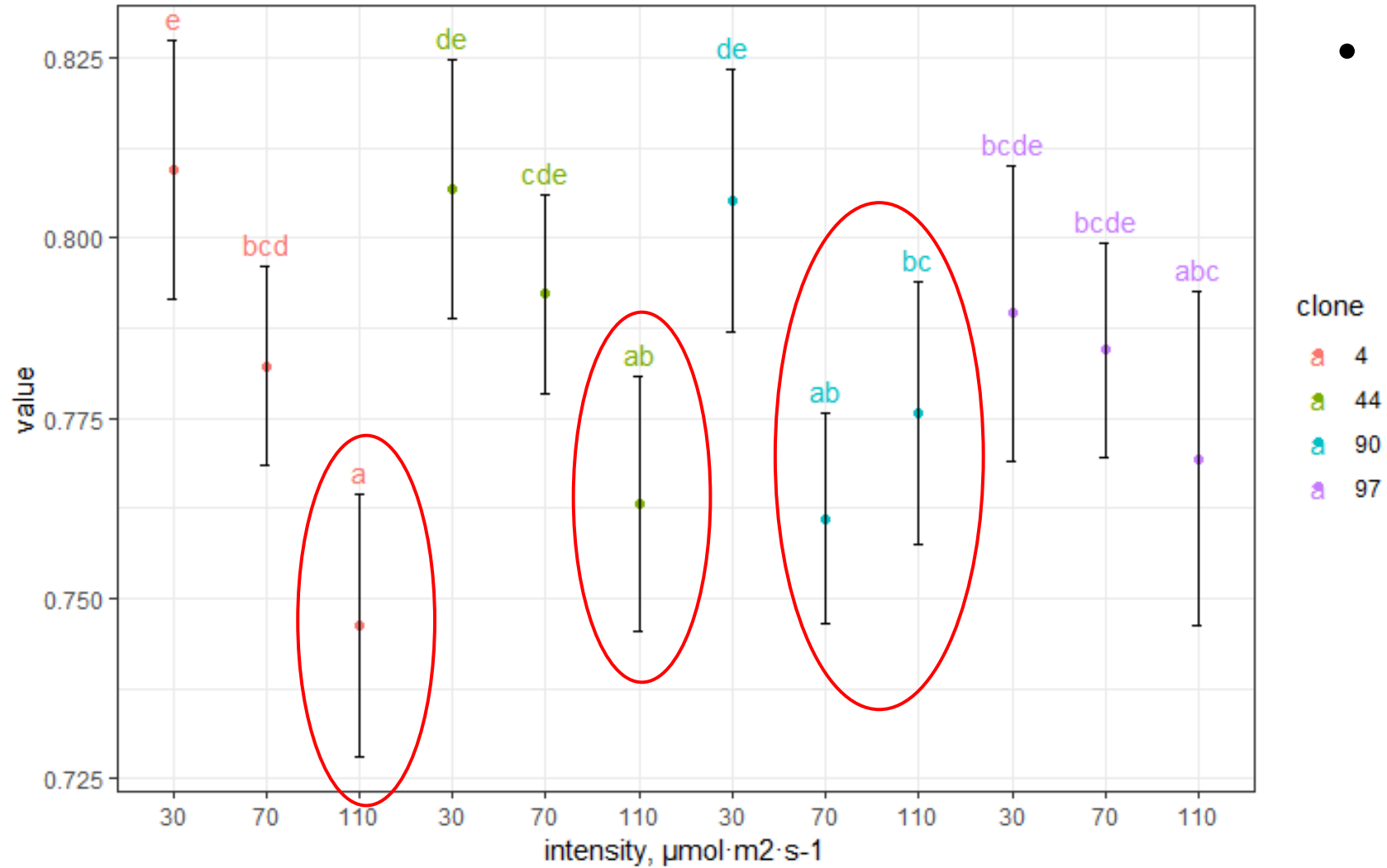
clone specific response to intensity



- Faster kinetics and reduced overall vitality under increased intensity

Fv/Fm

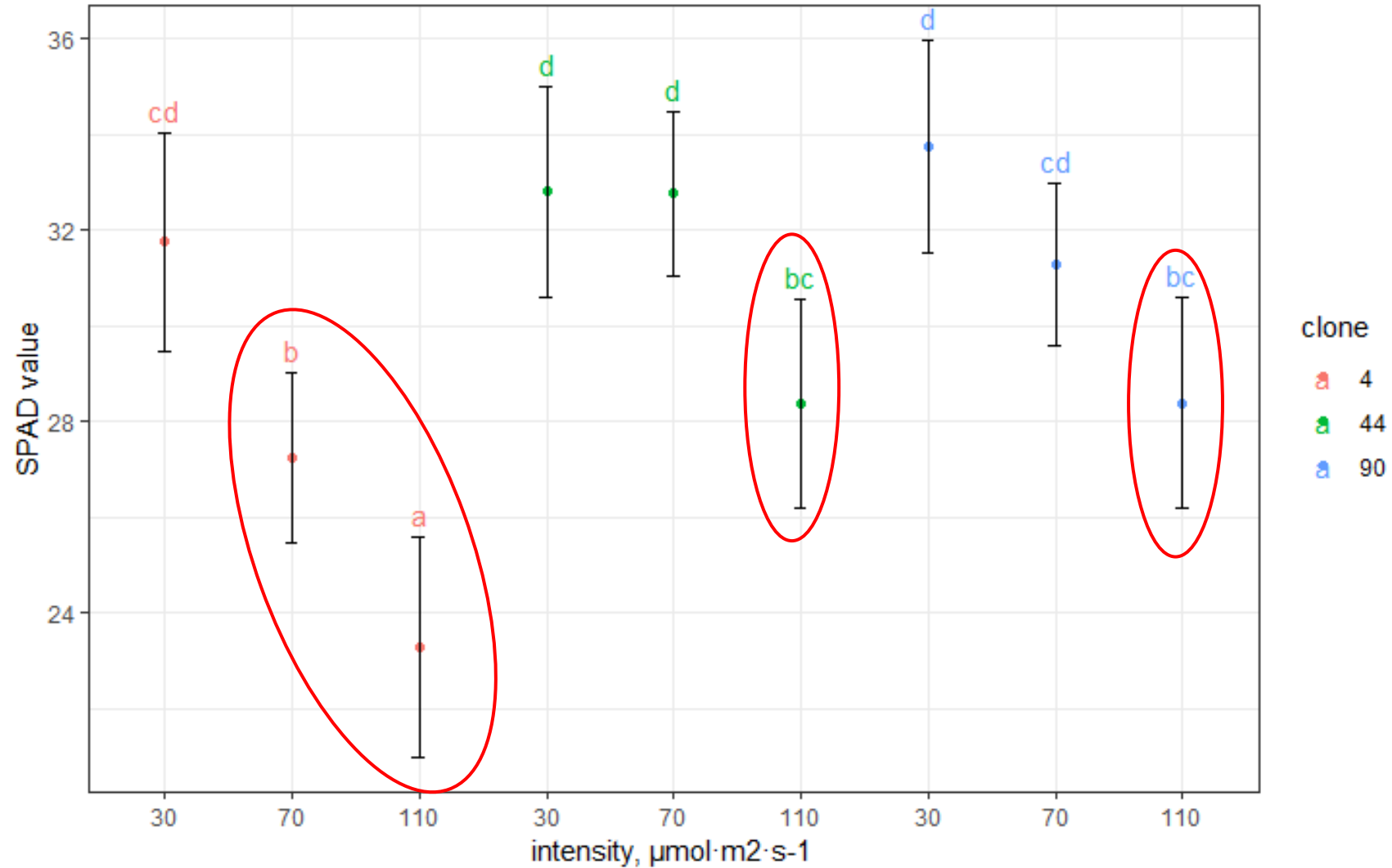
clone response to intensity



- Reduced PSII efficiency (quantum absorption) under higher intensities

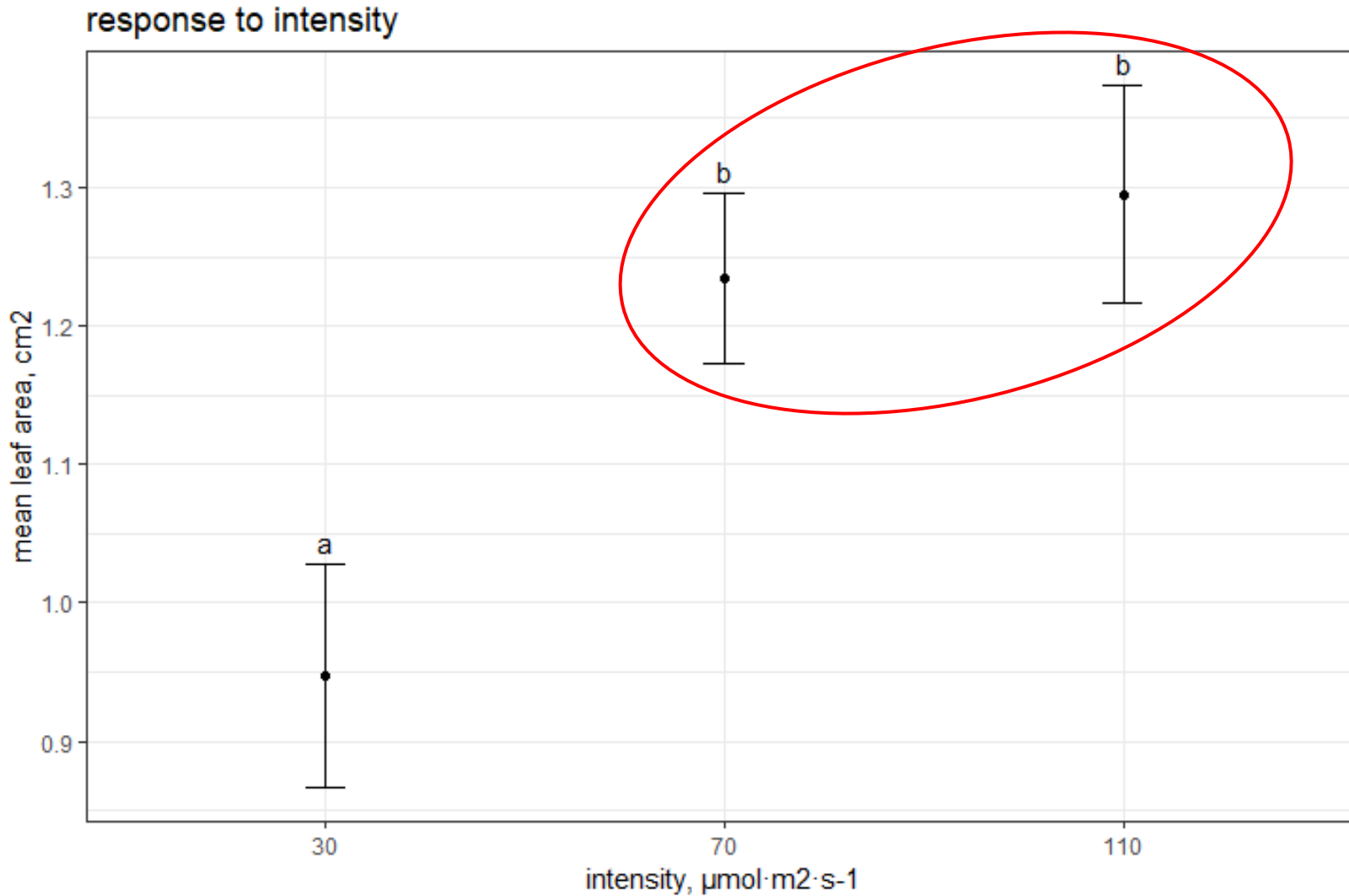
SPAD

clone specific response to intensity



- Lower relative chlorophyll content with increasing intensity

Mean leaf area



- Higher intensities promote formation of larger leaves

Third internode total shoot length

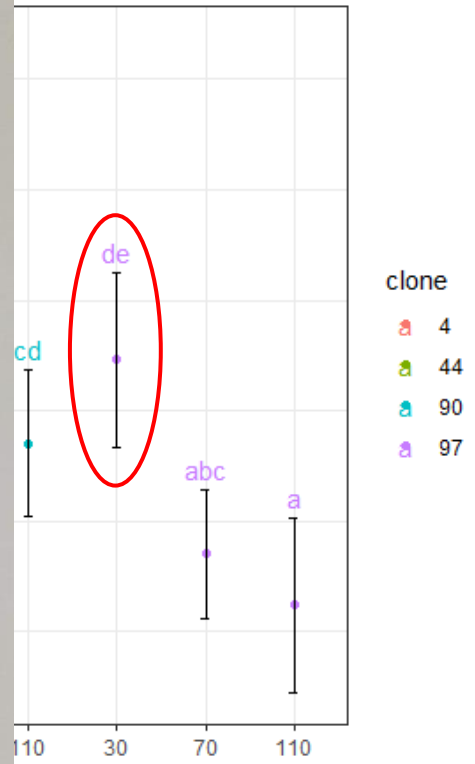
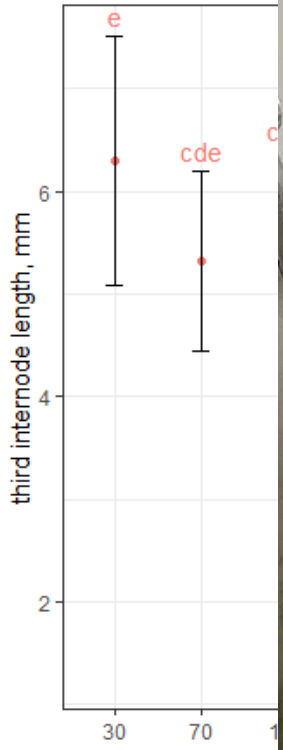


30

70

110

clone specific re



- Lower
- longer
- Necro

consequently,
low intensities

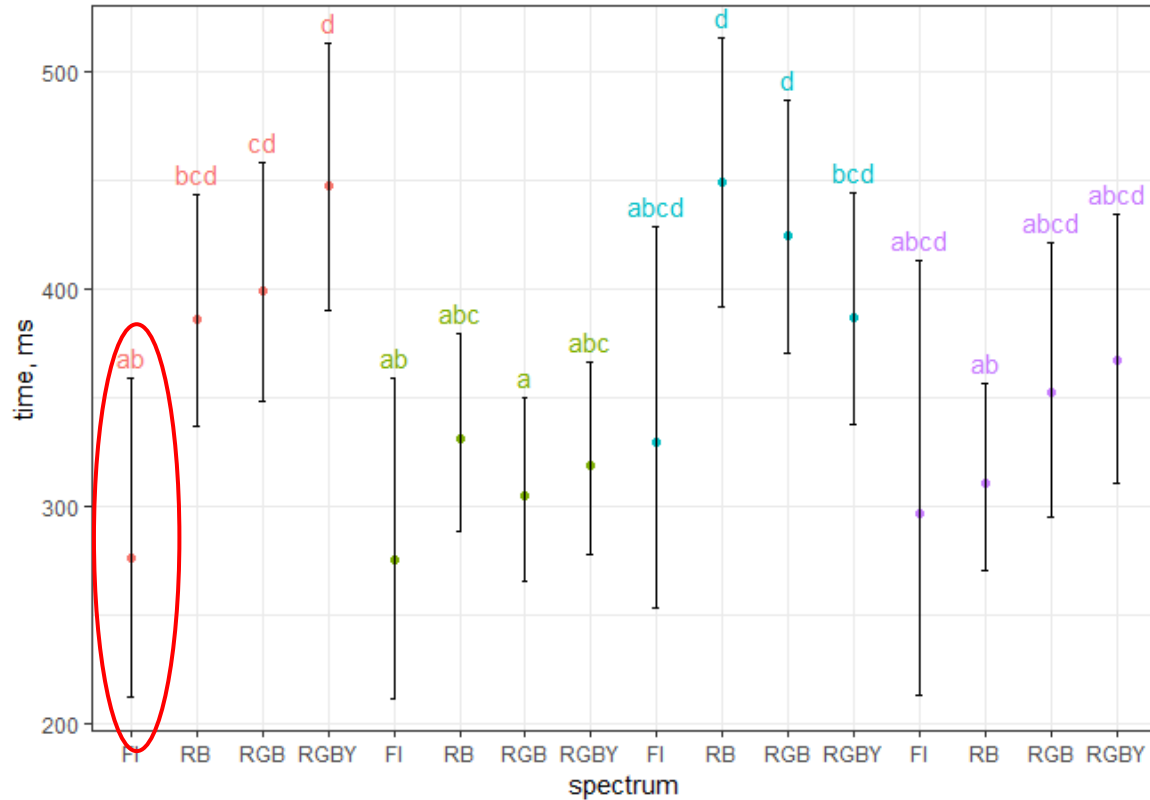
Summary



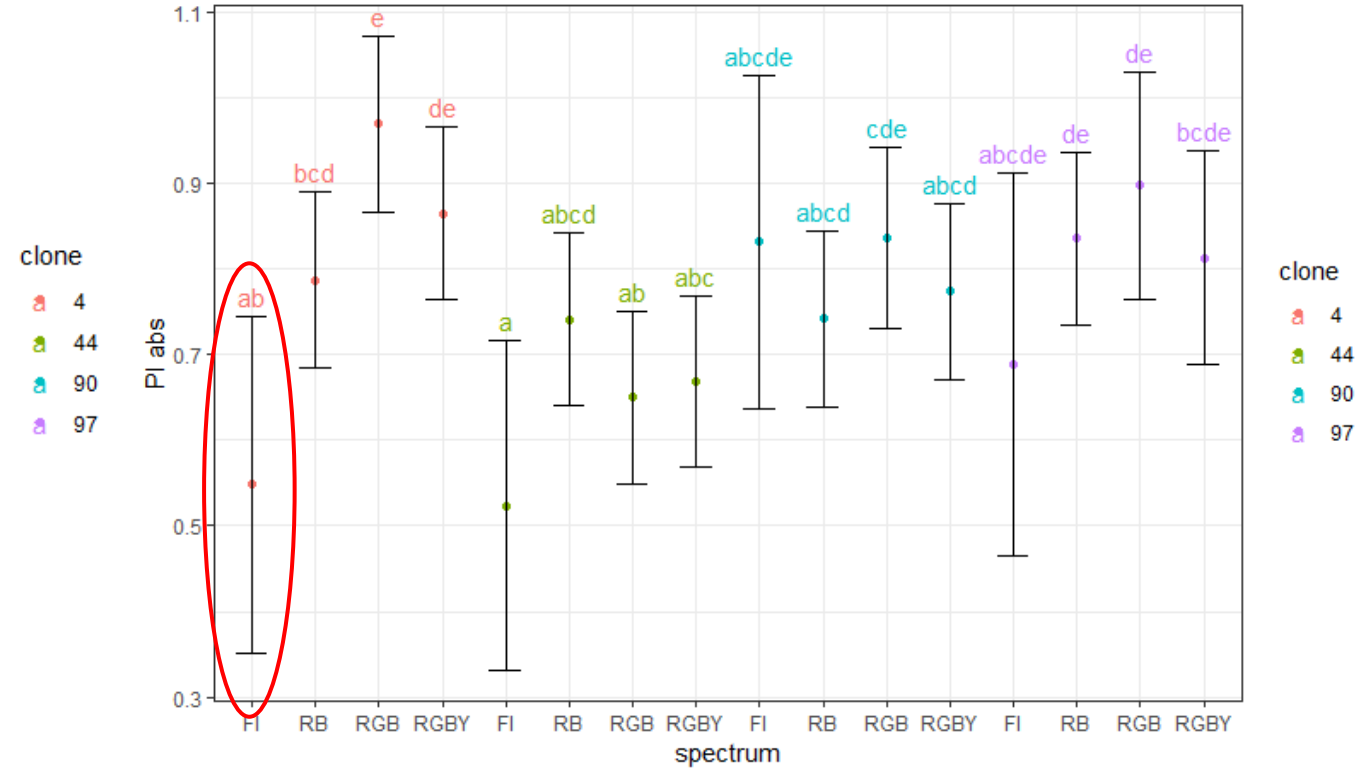
- Lower intensities induce “shade avoidance”
- Higher PSII efficiency, investing in shoot growth
- Combined approach - 30 and 70 μmol intensity

Performance index and t for Fm

clone response to spectrum



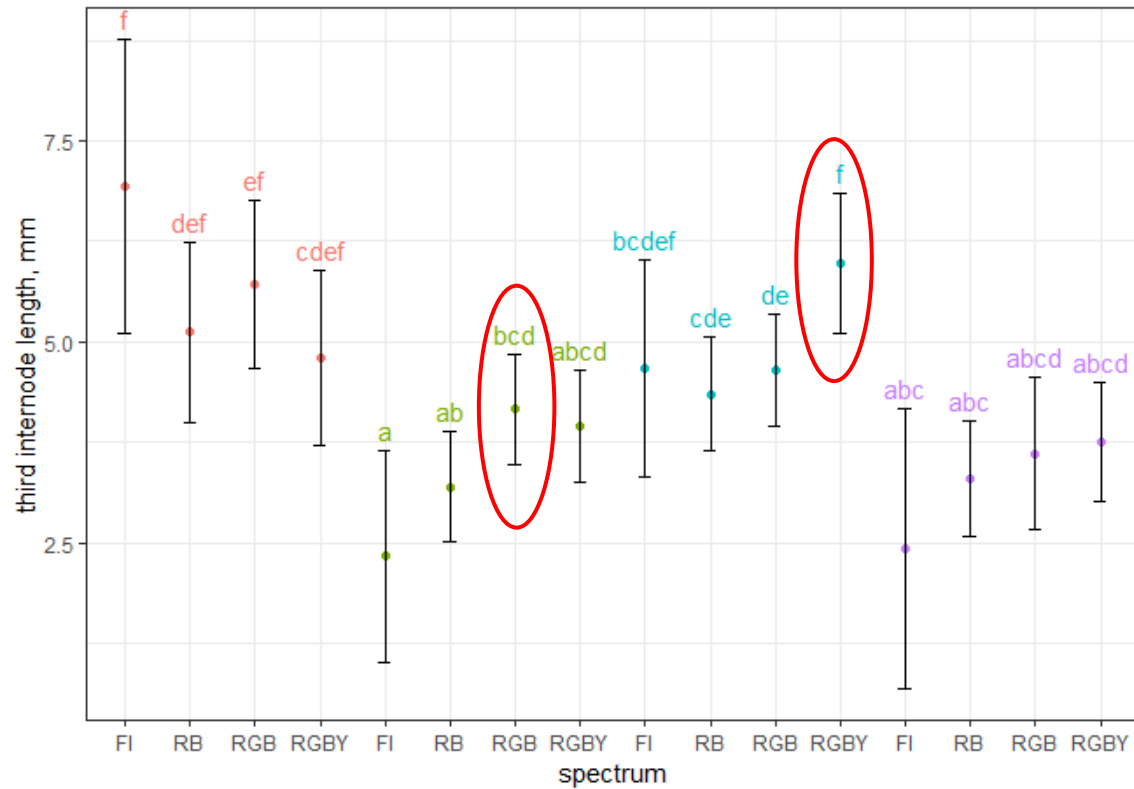
clone specific response to spectrum



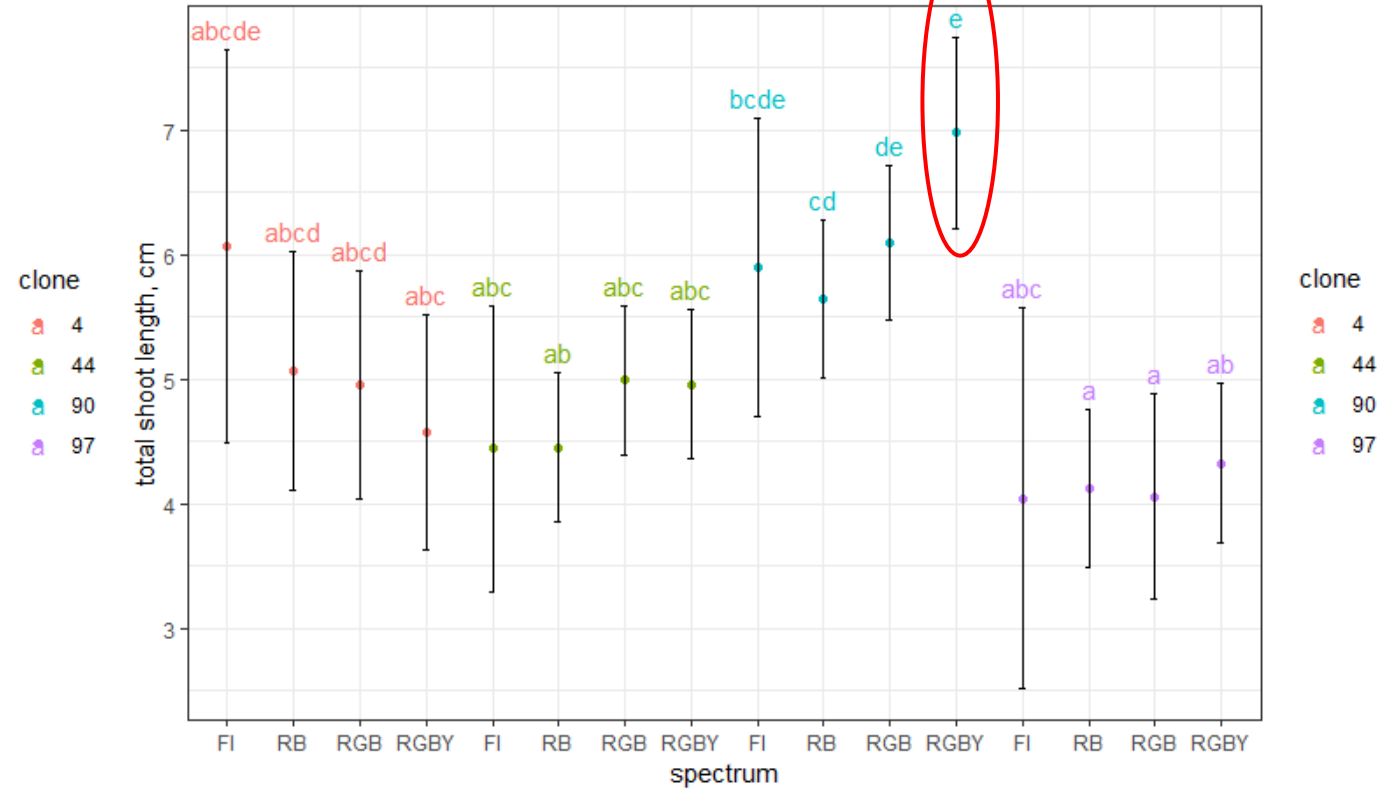
- Faster fluorescence kinetics and reduced overall plant vitality in response to reduced red light amount

Third internode, total shoot length

clone specific response to spectrum



clone specific response to spectrum



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!

NATIONAL
DEVELOPMENT
PLAN 2020



EUROPEAN UNION
European Regional
Development Fund

INVESTING IN YOUR FUTURE