Role of Shade Avoidance in Critical Period of Weed Control in *Beta vulgaris*

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INTRODUCTION

- Light reflected from plant leaves has a reduced red to far-red light ratio (R:FR)
- Plants can perceive neighboring plants through changes in R:FR
- Plants can modify their morphology and physiology to either tolerate or avoid impending competition
- This modified morphology and physiology may affect growth and yield of crops before direct shading occurs (Smith 1992)

Objective: evaluate effects of weed appearance time on growth and morphology of *B. vulgaris*

METHODS

- *B. vulgaris* seeds planted in 19 L plastic buckets on July 3, 2015
- Grass roots were separated from *B. vulgaris* roots to ensure there was no resource competition (Figure 1)
- Four weed (grass) appearance times: at crop emergence, four true-leaf stage (4 TL), six true-leaf stage (6 TL), and a weed-free control
- Randomized complete block design with 15 replicates
- Adequate moisture and nutrients were supplied and grass was clipped regularly to prevent shading of *B. vulgaris*
- Early-season data collected: leaf angle, petiole length, and number of leaves
- ANOVA and Fisher's protected LSD was used to analyze all data

Figure 1. Study setup ensuring no resource competition

RESULTS AND DISCUSSION

- Leaves were more erect (Figure 2 & Table 1) in weedy treatments compared to the weed-free treatment
- Petiole length was not strongly influenced by the presence of weeds (Table 1)
- Presence of weeds reduced number of *B. vulgaris* leaves (Figure 3)
- Effect of weed presence on leaf angle and number of leaves was greater when weedy treatment was initiated at emergence
- Reduction in leaf number may influence quantity of light intercepted by plants, which is likely to reduce *B. vulgaris* yield

Figure 2. *B. vulgaris* morphology was influenced by the presence of surrounding weeds

Table 1. Effects of weed presence on *B. vulgaris* leaf angle and petiole length

Initial weed appearance	Days after planting 12	24	31	38
	Leaf angle (°)			
Emergence	38.8*	47.0*	48.2*	35.0*
4 True leaf	30.2	27.3	51.3*	35.7*
6 True leaf	30.2	31.4	44.1*	34.5*
Weed-free	29.5	31.2	34.5	22.0*
	Petiole length (cm)[a]			
Emergence	–	2.2	4.3	5.7
4 True leaf	–	1.7	4.3	5.8
6 True leaf	–	1.9	4.0	6.0
Weed-free	–	1.6	3.8	5.1

*Significantly different from the weed-free treatment ($P < 0.05$)
[a]Petiole length was similar among treatments ($P < 0.05$)

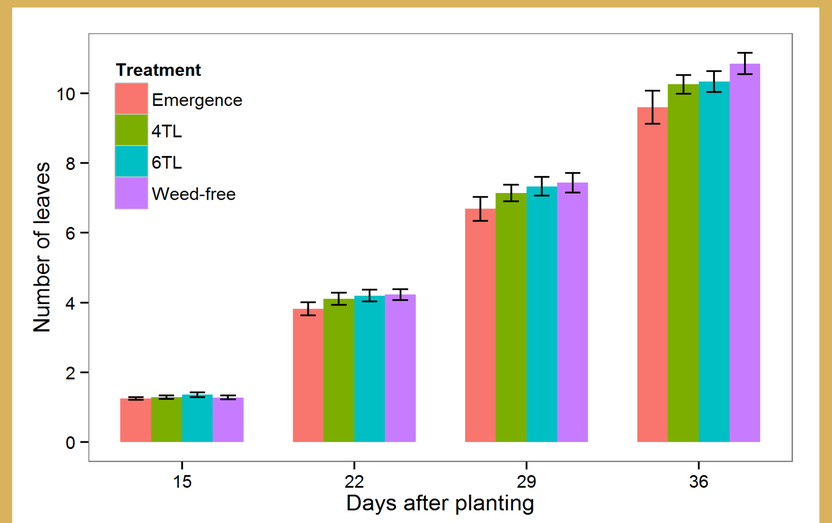

Figure 3. Effects of weed presence on *B. vulgaris* leaf development

CONCLUSIONS

- Shade avoidance reduced number of leaves and modified the morphology of *B. vulgaris*
- Shade avoidance response was more pronounced when weedy treatment was initiated at emergence
- The critical period of weed control in *B. vulgaris* may be influenced by shade avoidance responses

REFERENCE

Smith H (1992) The ecological functions of the phytochrome family. Clues to a transgenic programme of crop improvement. Photochem Photobio 56:815-822