Don’t shoot the messenger- Pampas grass has left the building!

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Cortaderia selloana

Cortaderia jubata

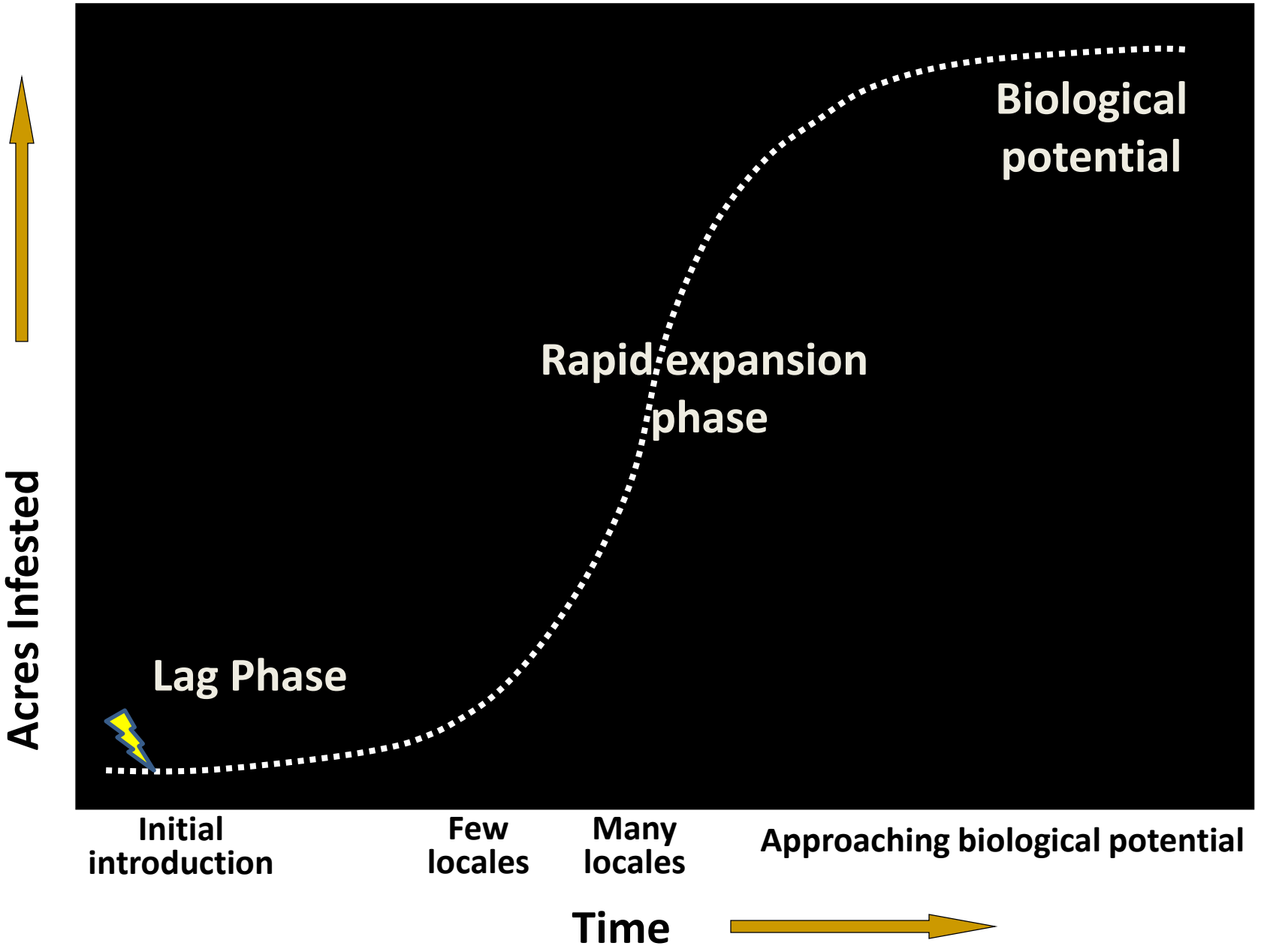
Pampasgrass

Jubatagrass

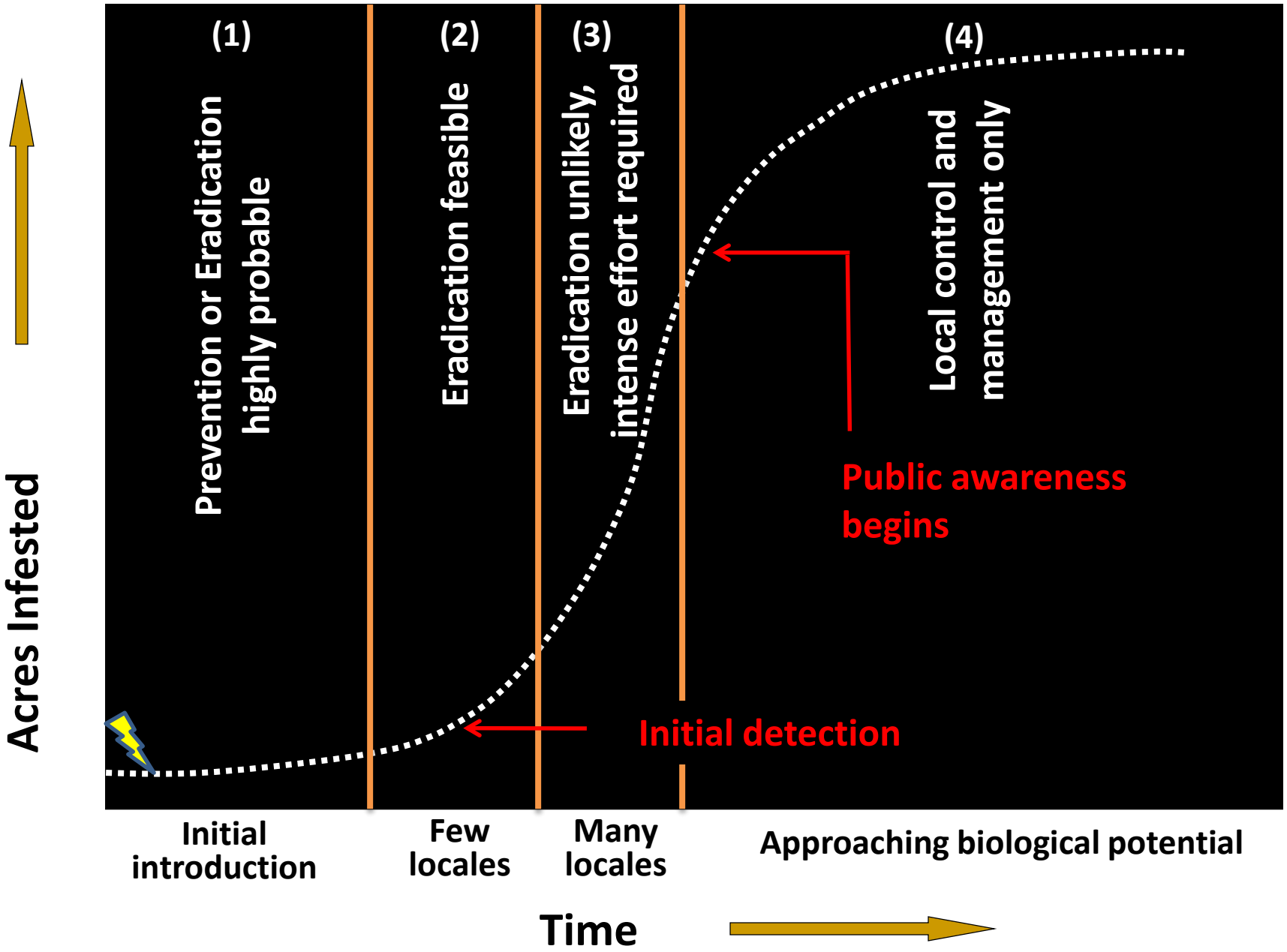
It is only a few plants escaping.

Why should I care?

Weed Increase Over Time

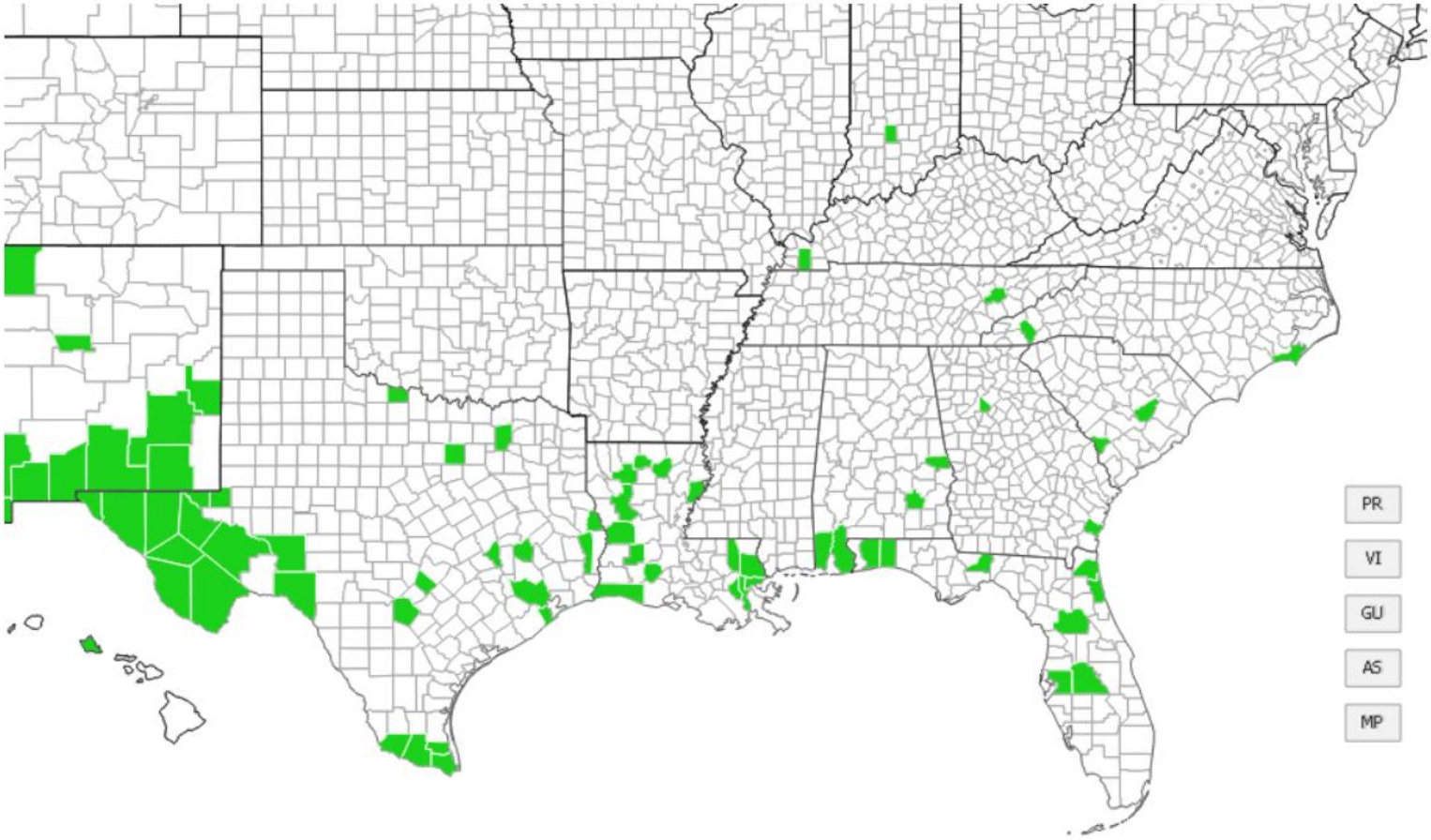


Weed Increase Over Time



Cortaderia selloana (Schult. & Schult. f.) Asch. & Graebn.

Distribution Maps: State / County / Southeast / Points on Google Maps



What are the potential impacts?

Pampas grass as a forestry weed in New Zealand


Jubatagrass

Reproductive Strategy

Cortaderia jubata	***Cortaderia selloana***
female plants only	functionally dioecious
apomictic	sexual
2n = 108	2n = 72
flowers early, 1st yr	later flowering, 2nd yr
flowers 1-2x /year	only flowers 1x/year

Pampas grass propagation

- In the past, clonally propagated (largely females)
- Now widely sold as seed
  - Increased number of males being sold

Hirts: Seed; Ornamental Grasses White Pampas Grass 200 Seeds - Cortaderia : Ornamental Grass - Windows Internet Explorer

http://www.hirts.com/White-Pampas-Grass-200-Seeds/dp/B000SM9X9Y?traffic_src=froogle&utm_medium=organic&utm_source=froogle&gclid=CIX

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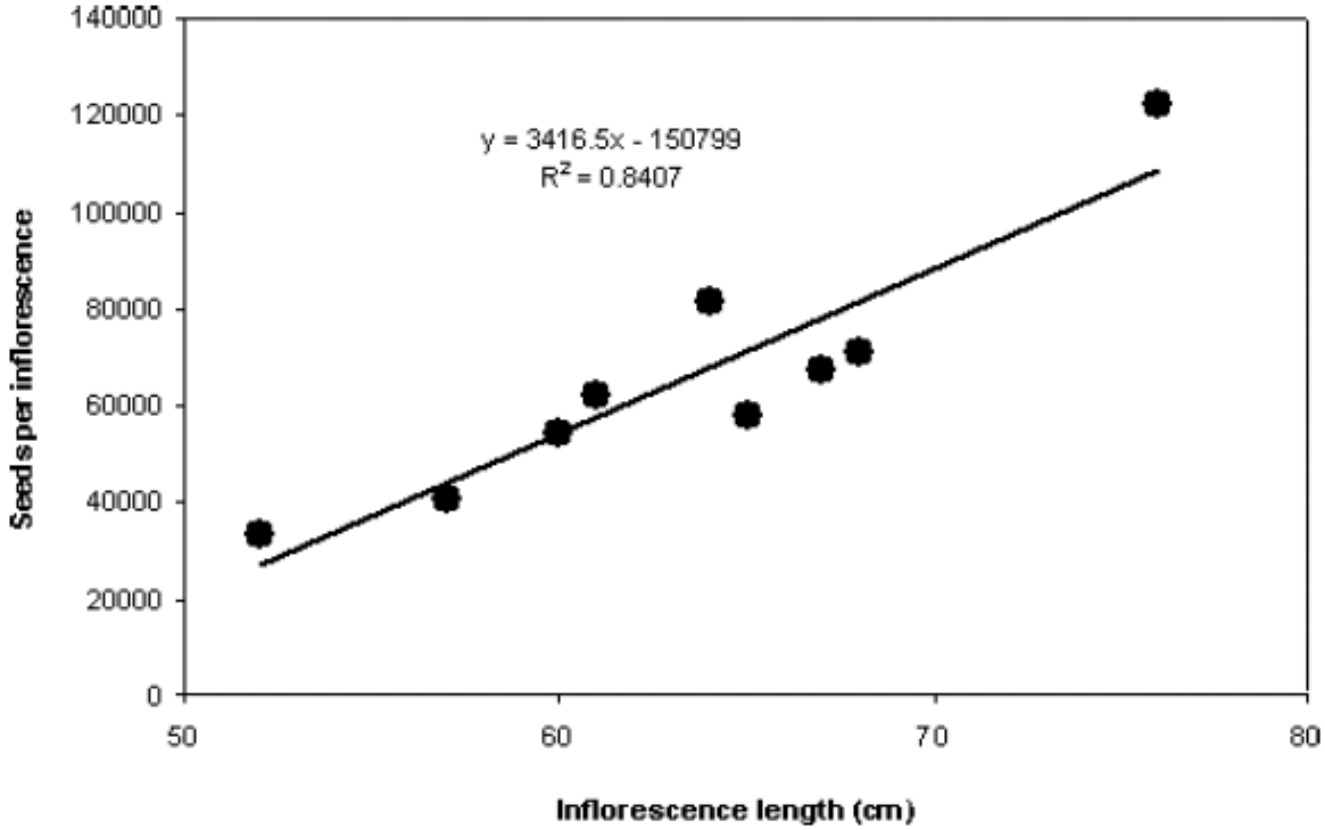
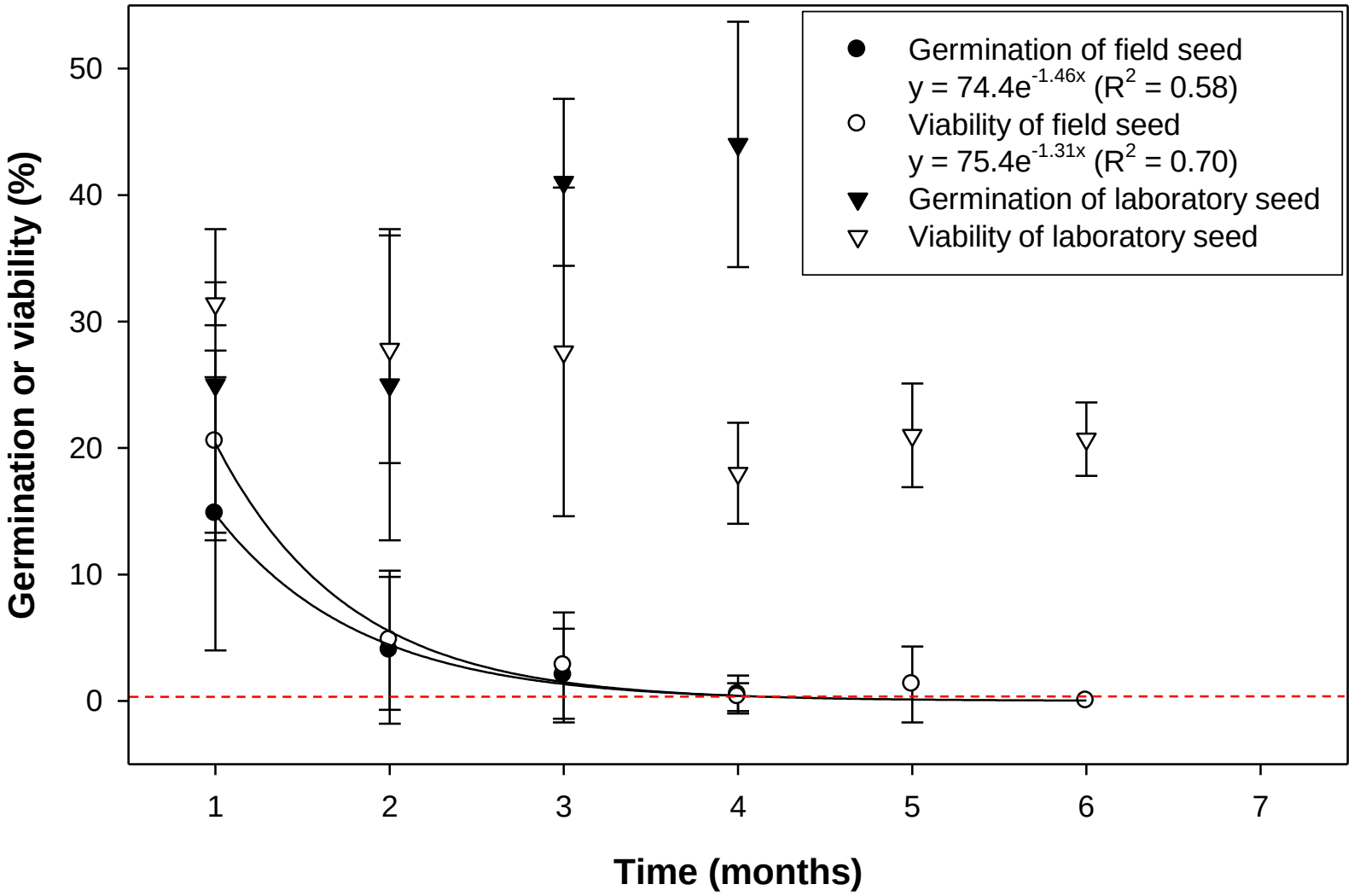


FIGURE 1. Correlation between the length of the inflorescence ($n = 9$) and the total number of seeds, including germinable and nongerminable. Each point represents an individual inflorescence. Seeds number was estimated by counting a 5% subsample of the total number of seeds on the inflorescence and multiplying by the correction factor.


Germination of field seed
y = 74.4e-1.46x (R2 = 0.58)
Viability of field seed
y = 75.4e-1.31x (R2 = 0.70)
Germination of laboratory seed
Viability of laboratory seed
Germination or viability (%)
Time (months)
0
10
20
30
40
50
1
2
3
4
5
6
7

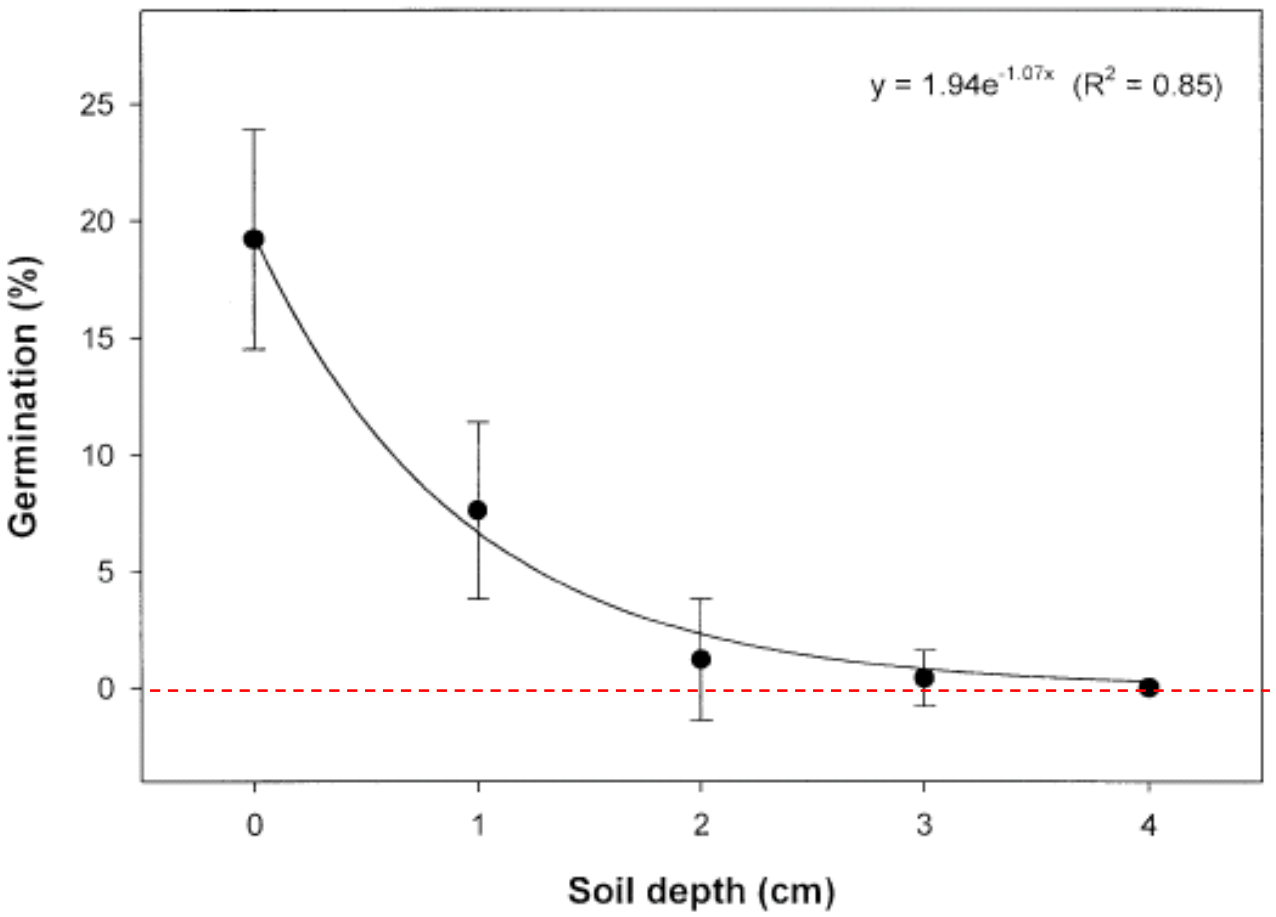
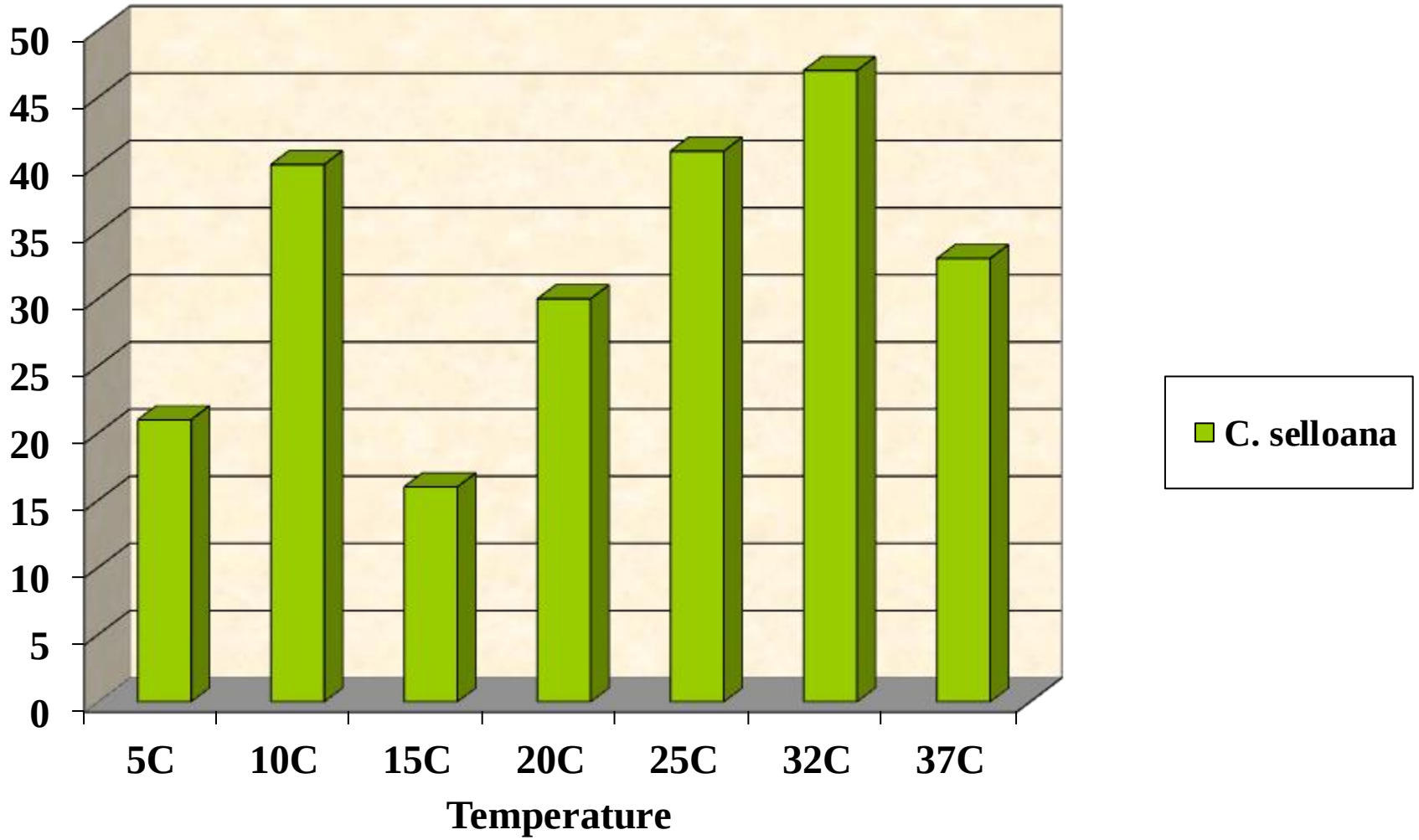
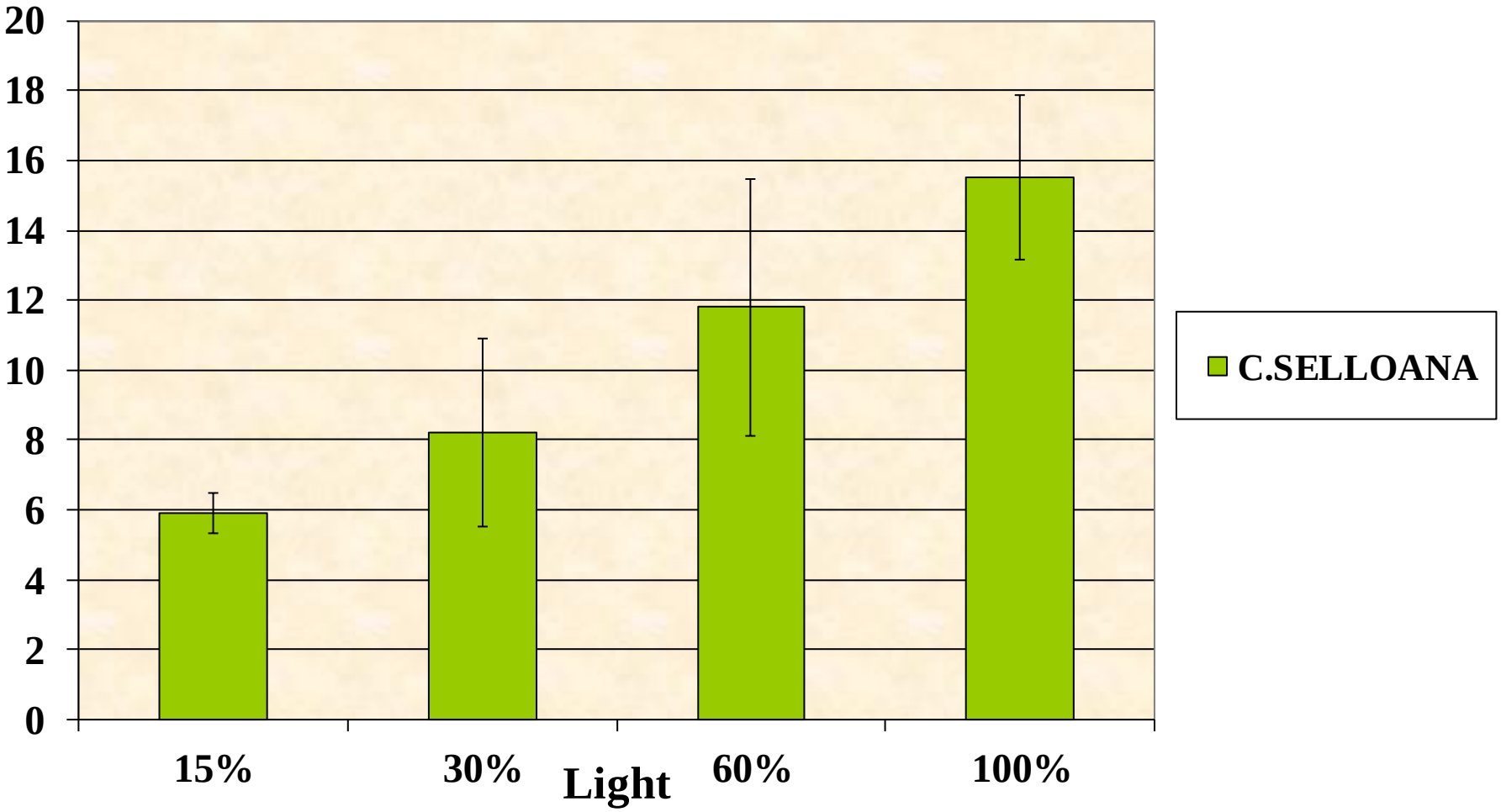


FIGURE 5. Jubatagrass seed germination at varying depths in the soil. The study was repeated with five replicates in each experiment. Bars represent ± SD.

Average % Seedling mortality



Average leaf production at 4 weeks



MECHANICAL AND CHEMICAL CONTROL

Hand digging

Pampas grass control

- Glyphosate
  - 3-5% v/v of a 41% ai or higher product
  - Optimal Timing: fall
- Imazapyr
  - 1% v/v for 4 lb/gal formulations
  - 2% v/v for 2 lb/gal formulations

Summary

- Escapes are becoming an issue
- Long term impact uncertain
- We are recommending aggressive removal of escapes
- Targeted removal of male pampas grass plants from landscape plantings?


Questions?

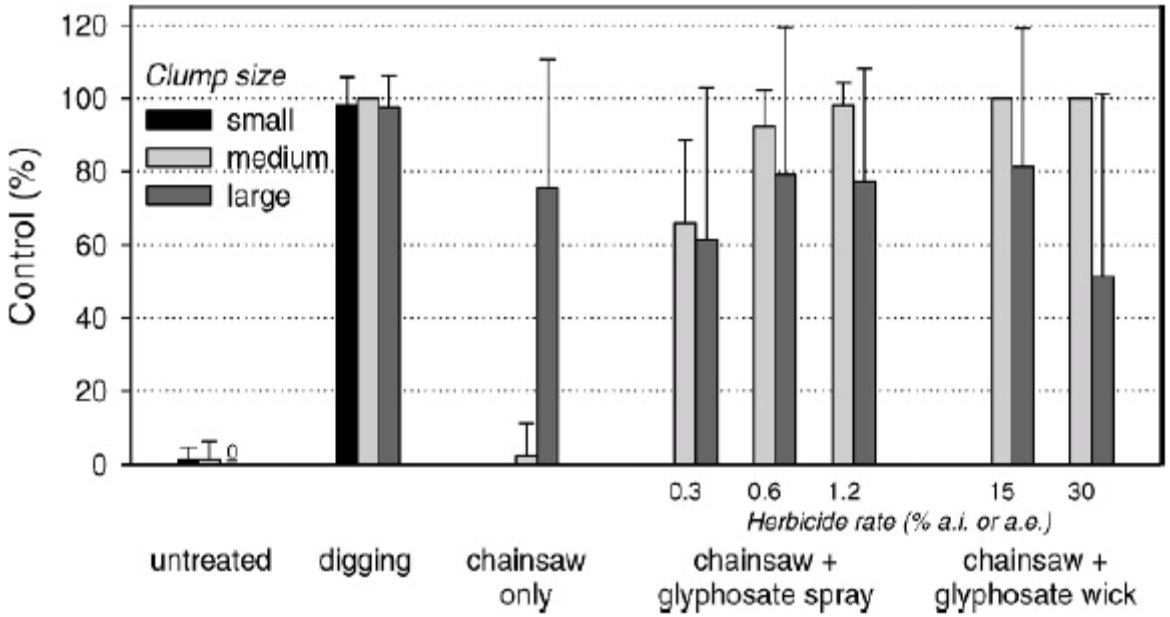
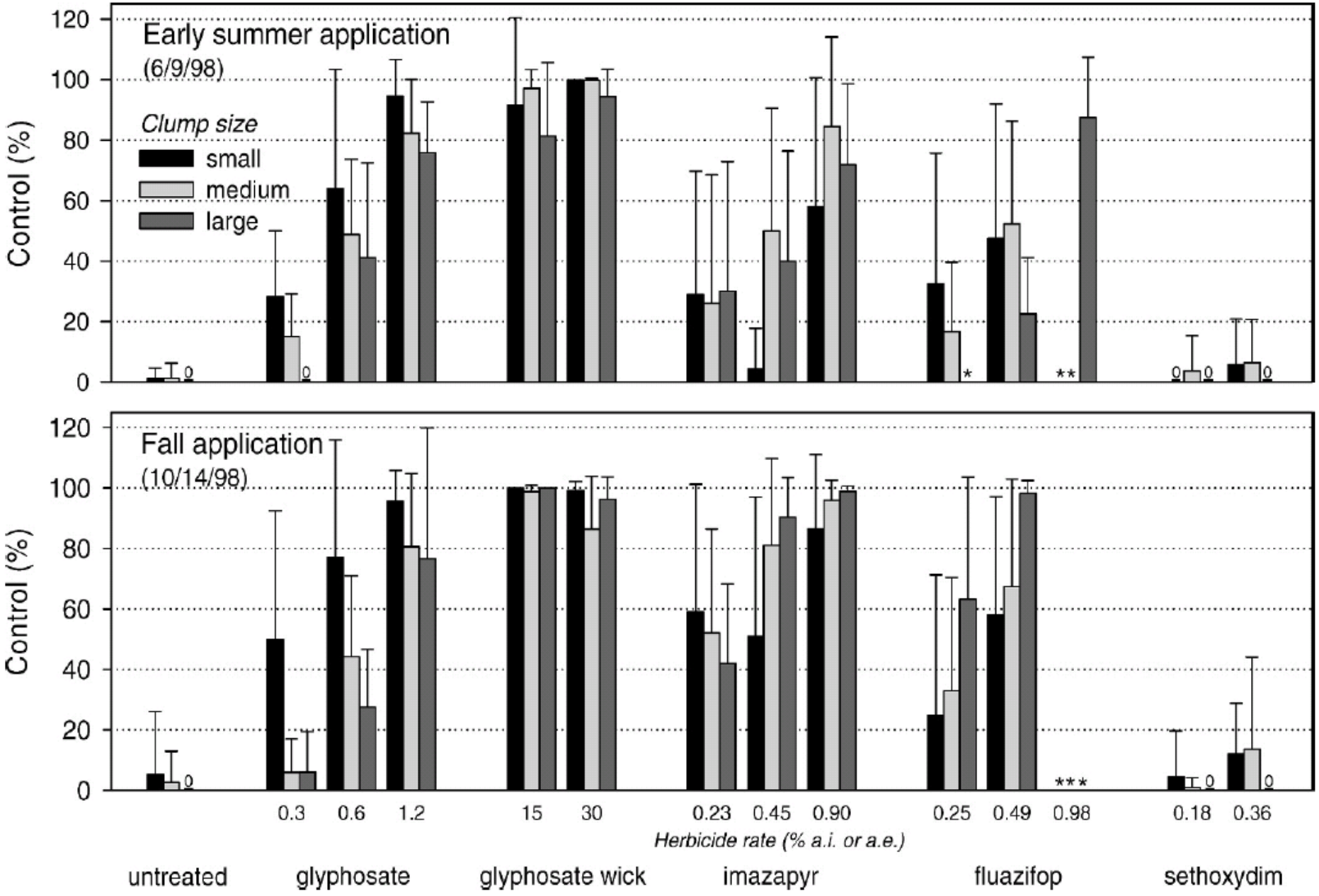
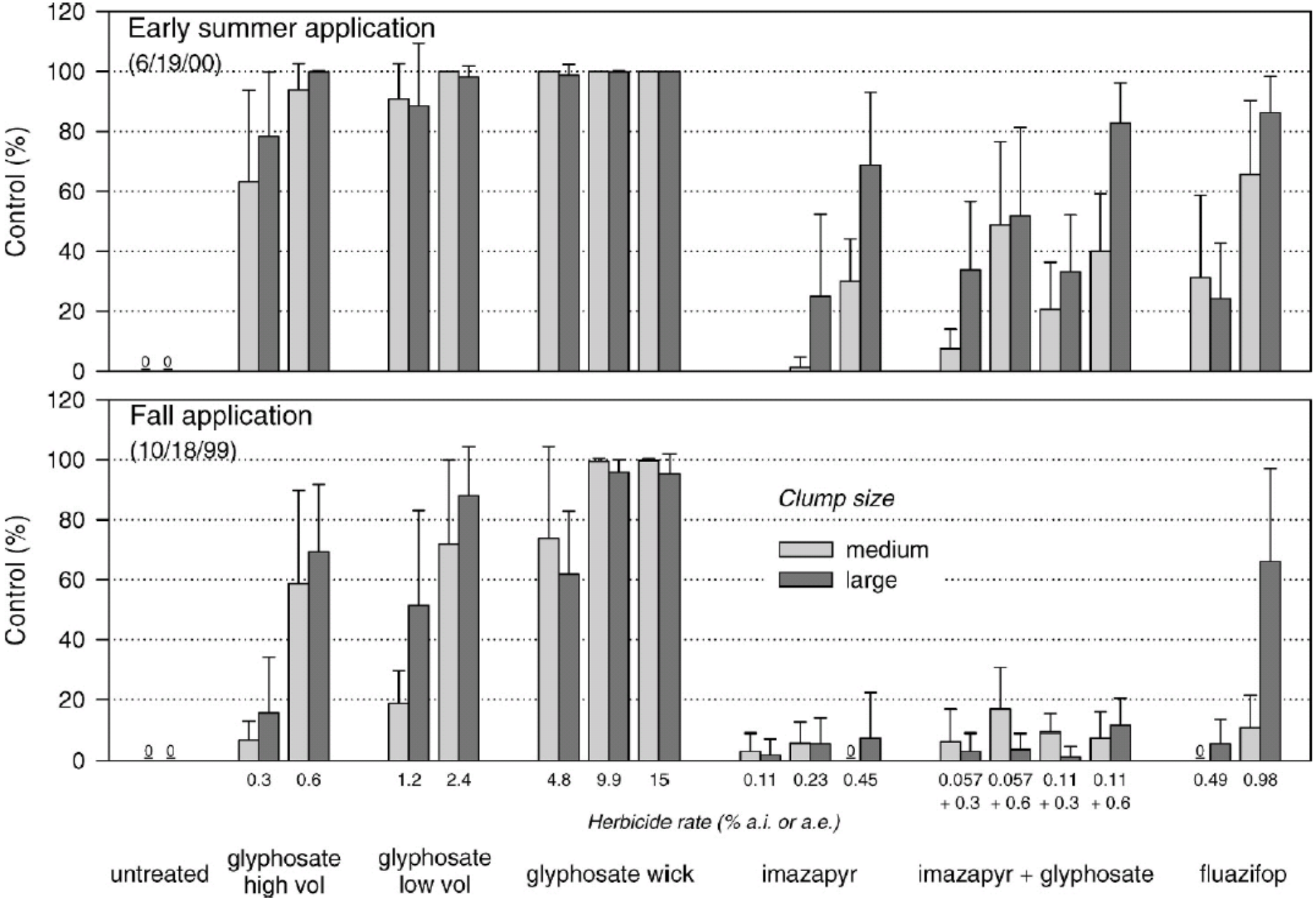


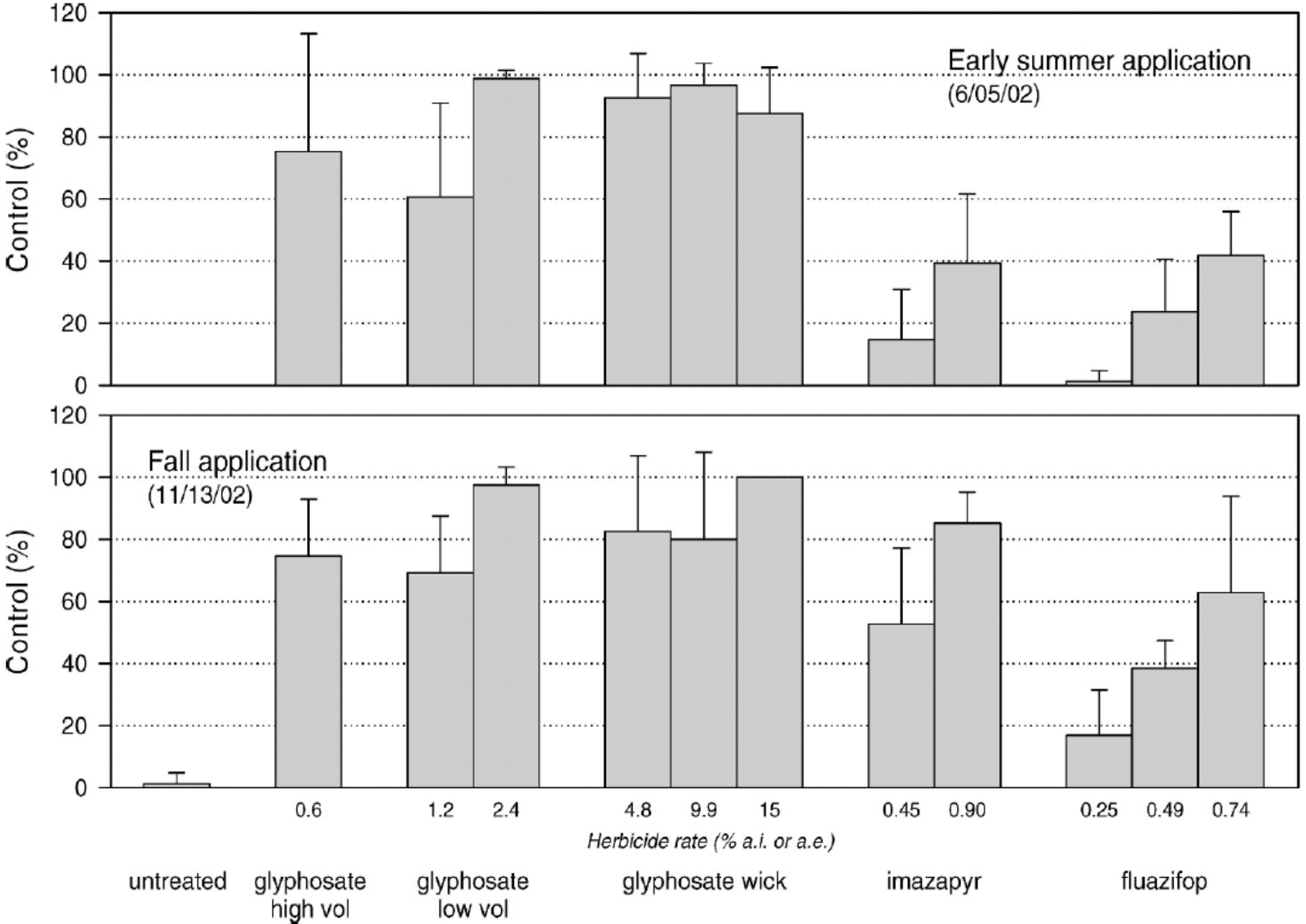
Figure 1. Control of small, medium, and large jubatagrass plants using mechanical methods and a combination of mechanical cutting followed by glyphosate treatment to recovered plants. All mechanical treatments were made on June 9, 1998, and glyphosate treatments were made on October 18, 1998. Evaluations were conducted on July 12, 1999 (early summer) and October 25, 2000 (fall). Small plants were not used in chainsaw treatments. Lines above bars represent one standard deviation of mean.

Table 1. Summary of herbicides, percent ae or ai, percent product, adjuvant, and application method used for in jubatagrass control treatments.

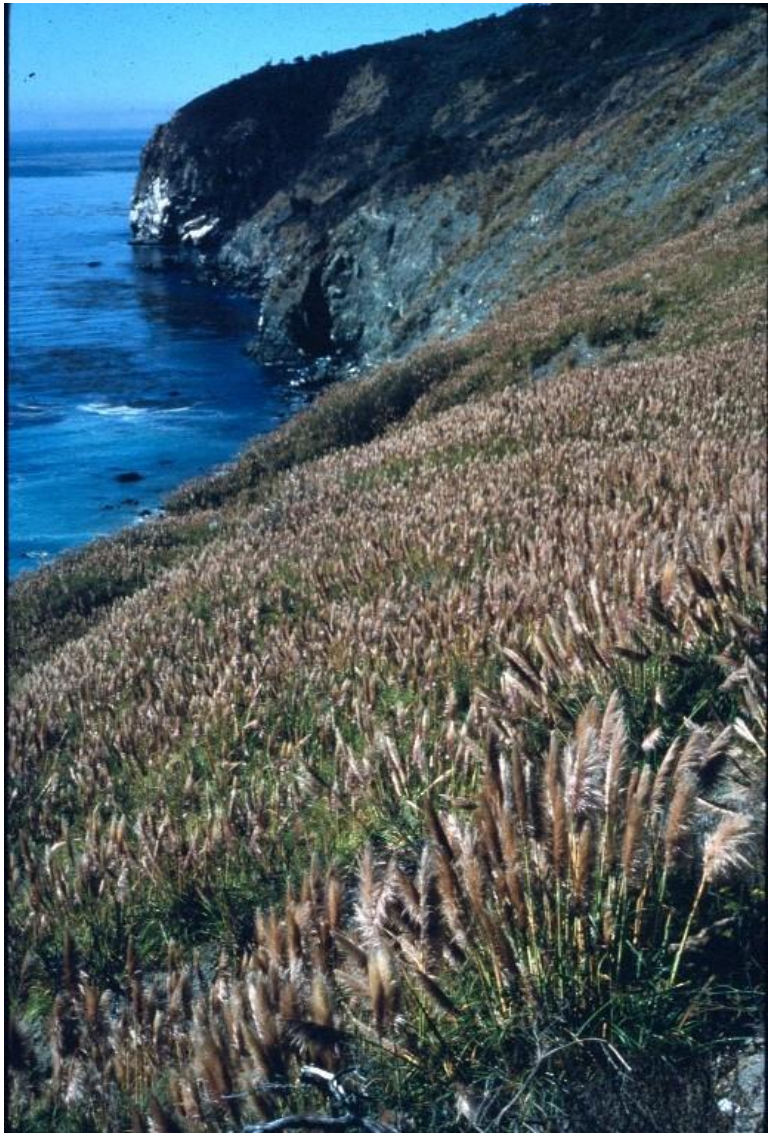
Herbicide	Trade name	% ae or ai	% Product	Adjuvant	Application method
Glyphosate	Roundup Pro®	0.3 ae	1	—	Foliar — high and low volume
		0.6 ae	2	—	Foliar — high and low volume
		1.2 ae	4	—	Foliar — low volume
		2.4 ae	8	—	Foliar — low volume
		4.8 ae	16	—	Ropewick
		9.9 ae	33	—	Ropewick
		15 ae	50	—	Ropewick
		30 ae	100	—	Ropewick
Imazapyr	Stalker®	0.057 ae	0.25	25% Hasten	Foliar — low volume
		0.11 ae	0.5	25% Hasten	Foliar — low volume
		0.23 ae	1	25% Hasten	Foliar — low volume
		0.45 ae	2	25% Hasten	Foliar — low volume
		0.90 ae	4	25% Hasten	Foliar — low volume
Fluazifop-P-butyl	Fusilade® DX	0.25 ai	1	0.05% Sylgard + 1% Herbimax	Foliar — low volume
		0.49 ai	2	0.05% Sylgard + 1% Herbimax	Foliar — low volume
		0.74 ai	3	0.05% Sylgard + 1% Herbimax	Foliar — low volume
		0.98 ai	4	0.05% Sylgard + 1% Herbimax	Foliar — low volume
Sethoxydim	Poast®	0.18 ai	1	0.05% Sylgard + 1% Herbimax	Foliar — low volume
		0.36 ai	2	0.05% Sylgard + 1% Herbimax	Foliar — low volume


Early summer application
(6/9/98)
Clump size
small
medium
large
Control (%)
120
100
80
60
40
20
0
0
0
*
**
0
0
0
Fall application
(10/14/98)
Control (%)
120
100
80
60
40
20
0
0
***
0.3
0.6
1.2
15
30
0.23
0.45
0.90
0.25
0.49
0.98
0.18
0.36
Herbicide rate (% a.i. or a.e.)
untreated
glyphosate
glyphosate wick
imazapyr
fluazifop
sethoxydim

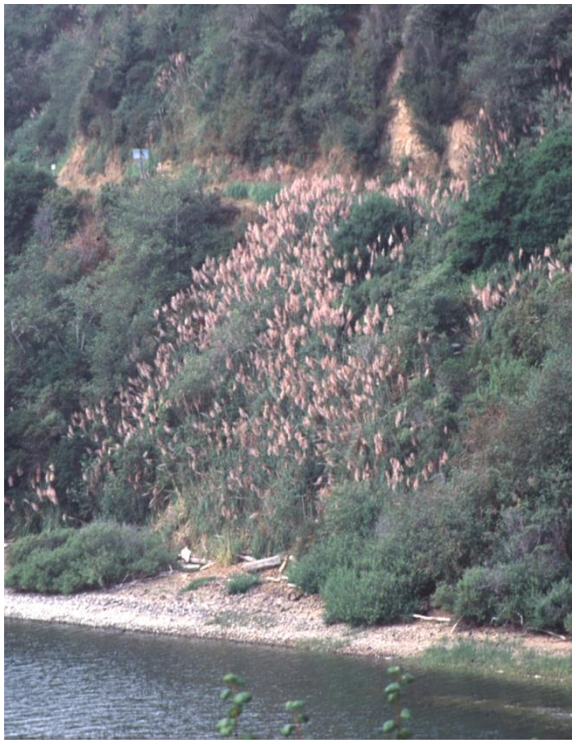

Early summer application
(6/19/00)
Fall application
(10/18/99)
Control (%)
120
100
80
60
40
20
0
Clump size
medium
large
0.3
0.6
1.2
2.4
4.8
9.9
15
0.11
0.23
0.45
0.057 + 0.3
0.057 + 0.6
0.11 + 0.3
0.11 + 0.6
0.49
0.98
Herbicide rate (% a.i. or a.e.)
untreated
glyphosate high vol
glyphosate low vol
glyphosate wick
imazapyr
imazapyr + glyphosate
fluazifop


Early summer application
(6/05/02)
Fall application
(11/13/02)
Control (%)
120
100
80
60
40
20
0
0.6
1.2
2.4
4.8
9.9
15
0.45
0.90
0.25
0.49
0.74
Herbicide rate (% a.i. or a.e.)
untreated
glyphosate high vol
glyphosate low vol
glyphosate wick
imazapyr
fluazifop

QUESTIONS?



Identification of Invasive Clones



Jubata grass, *Cortaderia jubata*, in California

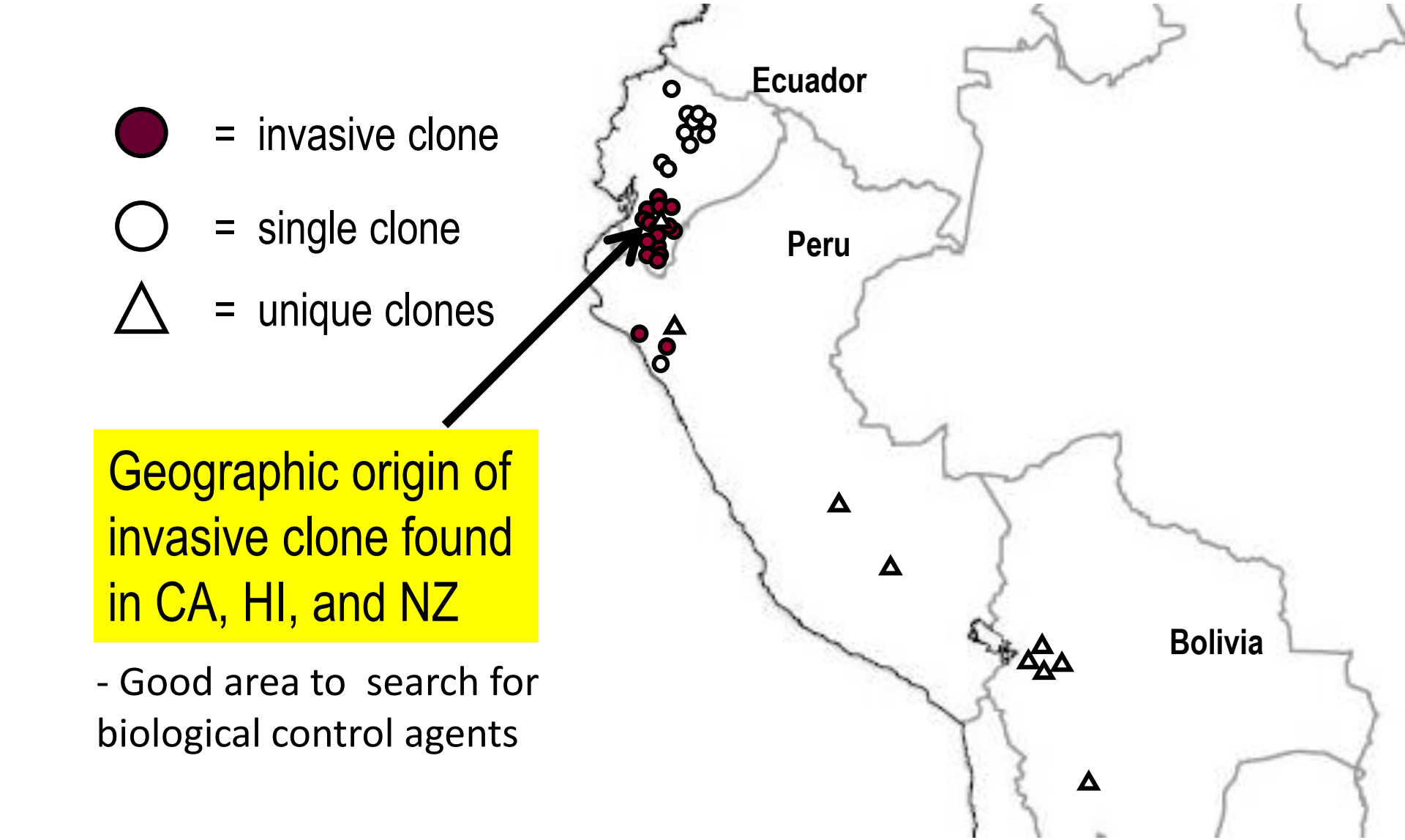
	Sample size	No. of genotypes	No. of clones
CA	233	8	1
HI	28	1	1
NZ	16	5	1
SA	83	21	14

Same invasive clone

Microsatellite markers identified the SAME invasive clone in CA, HI, and NZ

Diversity and Distributions 15(2009):148-157

Microsatellite markers also identified the ***geographic origin*** of the invasive clone



Geographic origin of invasive clone found in CA, HI, and NZ

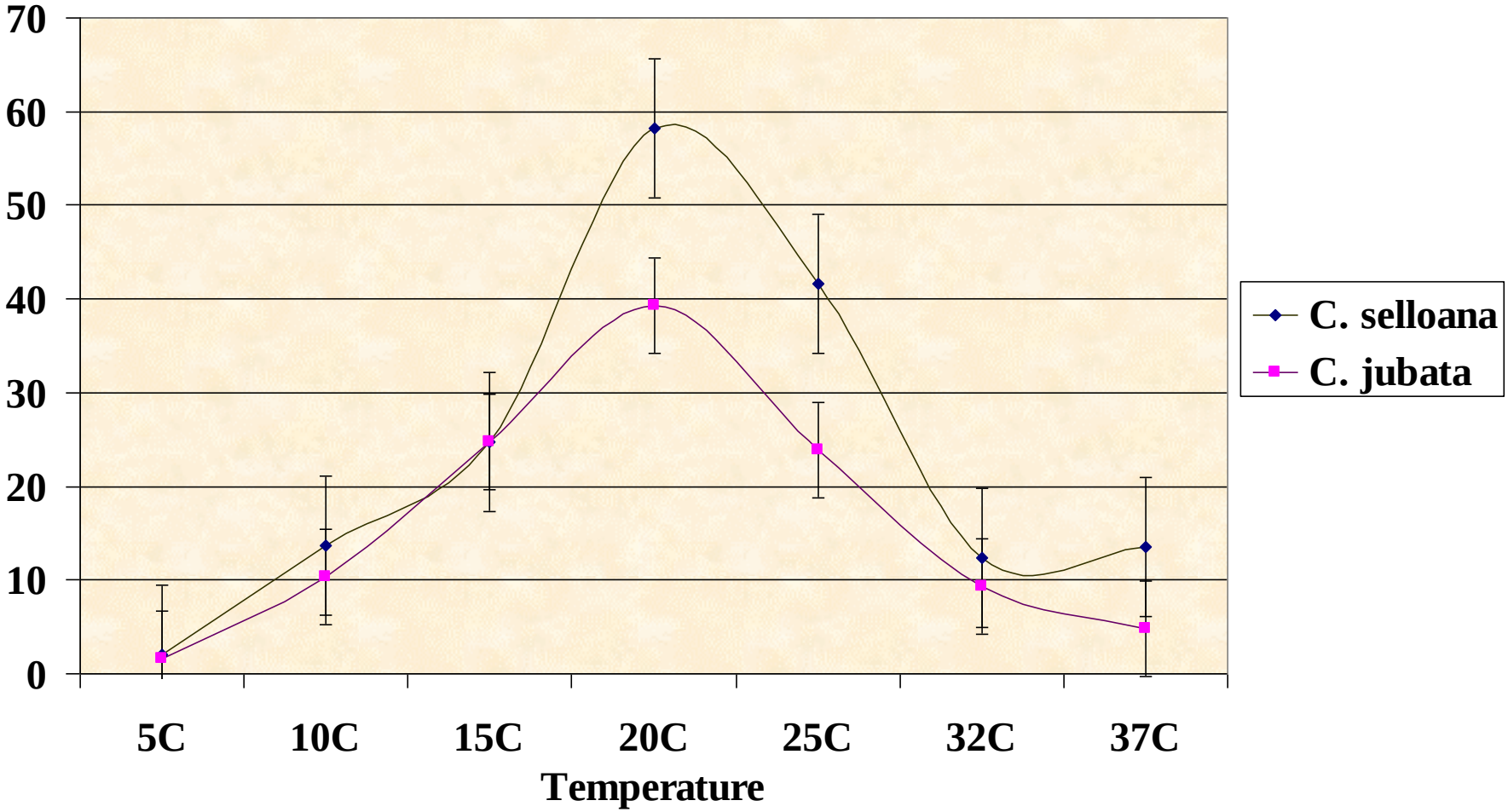
- Good area to search for biological control agents

Temperature: Expected results

- In hot temps, *C. selloana* has greater survivorship and growth than *C. jubata*

- In cool temps, *C. jubata* may have a slight growth advantage

Average height of surviving seedlings

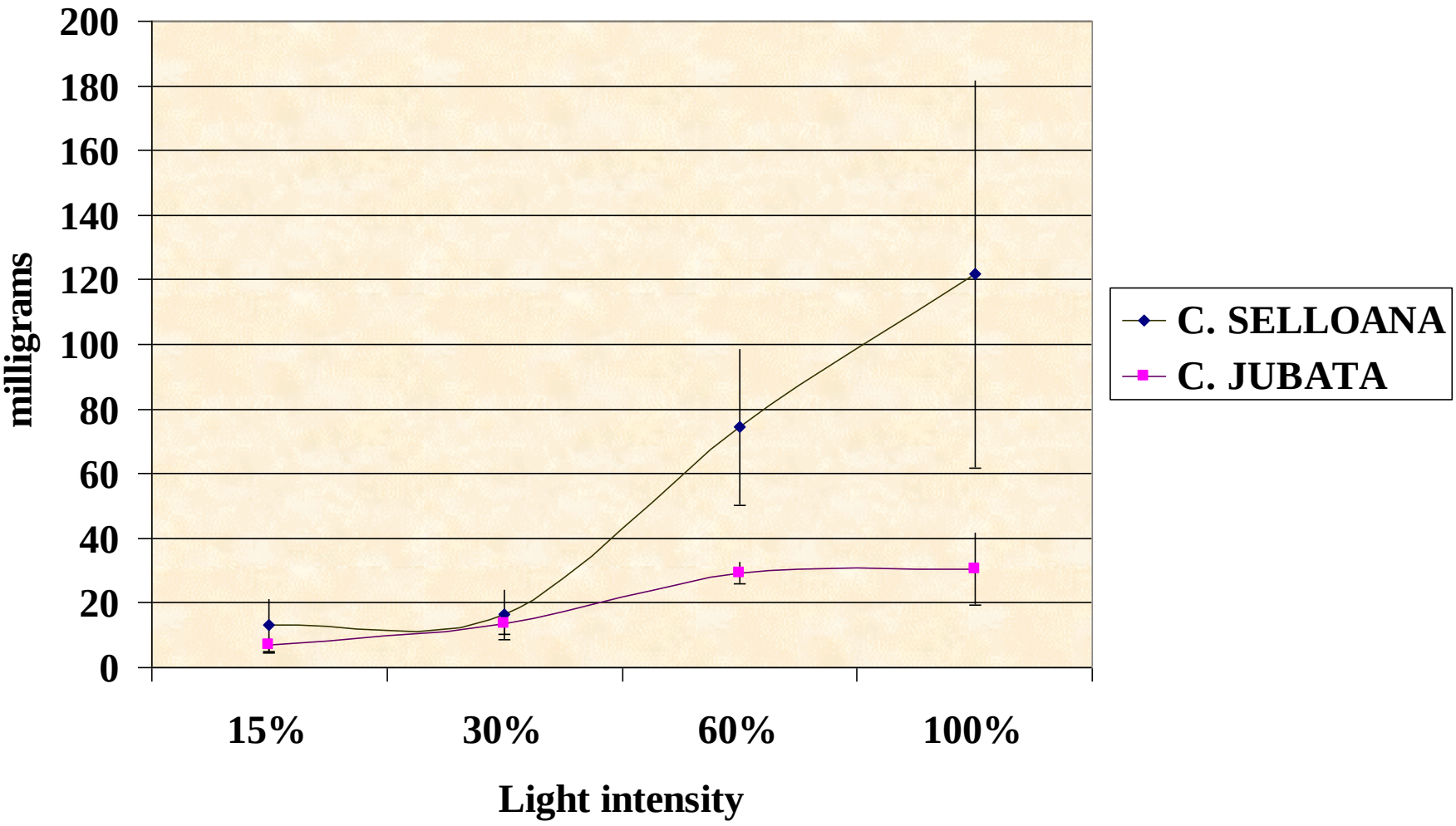


Light Intensity: Expected results

- *C. selloana* grows better than *C. jubata* under intense light

- Both species do well in moderate light and poorly in very dense shade

Dry root weight of surviving seedlings



ECONOMICS OF THE DIFFERENT TREATMENTS

Table 2. Cost analysis for effective chemical control of jubatagrass. Analysis includes chemical and adjuvant cost and labor costs. Labor costs based on $20/h. Final calculations are represented as the average cost of control for large plants, and the data are represented as costs per 1 m^2 plant area. Only treatments providing > 85% control are included.

Herbicide	Timing	Treatment	Rate (% product, % ai or ae)	Average % control	Average herbicide cost ($)	Average adjuvant cost ($)	Average labor cost based on $20/h ($)	Estimated cost per 1 m^2 plant ($)
Glyphosate	Early summer	Low volume	8 (2.4 ae)	99	0.08	0	0.20	0.28
	Fall	Low volume	8 (2.4 ae)	93	0.08	0	0.20	0.28
	Early summer	High volume	2 (0.6 ae)	88	0.05	0	0.33	0.38
	Early summer	Ropewick	16 (4.8 ae)	97	0.17	0	0.63	0.80
	Early summer	Ropewick	33 (9.9 ae)	98	0.35	0	0.63	0.98
	Fall	Ropewick	33 (9.9 ae)	88	0.35	0	0.63	0.98
	Early summer	Ropewick	50 (15 ae)	90	0.53	0	0.63	1.16
	Fall	Ropewick	50 (15 ae)	99	0.53	0	0.63	1.16
	Early summer	Ropewick	100 (30 ae)	94	1.06	0	0.63	1.69
	Fall	Ropewick	100 (30 ae)	96	1.06	0	0.63	1.69
Imazapyr	Early summer	Low volume	4 (0.90 ae)	92	0.30	0.11	0.20	0.61
Fluazifop	Fall	Low volume	4 (0.98 ai)	87	0.12	0.03	0.20	0.35