

Weed Management Trials in Bramble Crops

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Recent Red Raspberry Trials



Raspberry Herbicide Trials

- Three trials were conducted in northwestern Washington during 2014 and 2015:
- **New herbicide trial** (26 treatments)
 - Herbicides included non-yet registered products **Alion** (indaziflam), **Quali-Pro quinclorac**, **Treevix** (saflufenacil), and **Zeus** (sulfentrazone) used alone or with **diuron**, **Gramoxone**, **simazine**, and **Sinbar**
- **IR-4 trial** (5 treatments)
 - Treevix applied **PRE**, at **cane burning**, or one of two **POST** timings
- **Zeus Prime trial** (8 treatments)
 - Zeus Prime (sulfentrazone + carfentrazone) applied **PRE**, at cane burning, alone or mixed with Matrix (rimsulfuron)

General Weed Control Ranges

New Herbicide Trial

Base Herbicide	April 28	June 9	August 7
Alion (7)	98 to 100%	93 to 100%	65 to 93%
Treevix (7)	77 to 100%	82 to 98%	68 to 97%
Quinclorac (7)	---	78 to 98%	77 to 93%

Zeus Prime Trial

Base Herbicide	April 28	June 9	August 7
ZP (3)	88 to 98%	90 to 97%	83 to 95%
ZP + Matrix	98%	98%	85%
FMC1, FMC2	98%, 97%	98%, 97%	87%, 92%

Percent Quackgrass Cover

New Herbicide Trial, 2014

Treatment	Initial*	April 28	June 9	August 7
Alion + Gramoxone	33	8	5	17
Alion + Gramox + Sinbar	83	23	43	60
Alion + Gramox + Simaz	47	8	7	30
Alion + Gramox + Diuron	65	17	13	47
Treevix + Sinbar	35	33	3	20
Treevix + Diuron	42	45	25	32
Alion + Gramox + Quin	28	3	5	15
Sinbar + Quinclorac	33	25	2	17

*Initial = percent quackgrass cover before herbicides applied

NOTE: Plots also treated with Select Max (clethodim) on May 7

Percent Quackgrass Cover

Zeus Prime Trial, 2014

Treatment	Initial*	April 28	June 9	August 7
ZP (PRE, low)	58	60	40	82
ZP (PRE, hi)	30	32	20	25
ZP (PRE + Matrix)	40	18	20	77
Gramoxone	60	38	20	52
Gramoxone + FMC1	43	13	10	50
Gramoxone + FMC2	65	13	8	53
ZP (POST)	35	28	8	32
Nontreated	70	95	55	98

*Initial = percent quackgrass cover before herbicides applied

Primocane Control

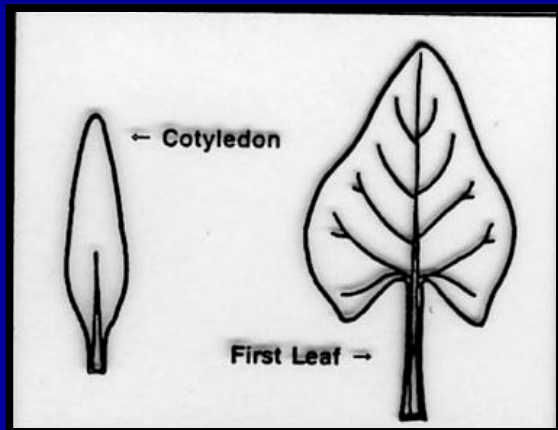
New and FMC Herbicide Trials

Base Herbicide	April 10	April 28	May 7
Paraquat (1)	55%	68%	8%
Paraquat+ (8)	60 to 100%	58 to 82%	10 to 57%
Treevix (2)	93 to 100%	73 to 82%	53 to 65%
Treevix+ (5)	43 to 100%	62 to 83%	8 to 65%
ZP (PRE, 3)	93 to 95%	68 to 77%	5 to 35%
ZP (POST, 1)	---	95%	57%

Herbicide	April 10	April 28	May 7
Treevix (PRE)	77%	67%	37%
Treevix (POST)	--	88%	60%

Other Observations, 2015

- **Wild buckwheat** was present in the Zeus Prime trial
 - Control in late April was **> 90% with Zeus Prime**, whether applied in late dormancy or as a cane burner
 - Control with **paraquat alone** was **75%** by late April, although not statistically different than **Zeus Prime**
 - By mid-August, cover was 37 to 38% in **nontreated plots** or when treated with **paraquat alone**
 - Cover was about 15% in plots treated with **Zeus Prime + Surflan + Paraquat**, **Zeus Prime + Matrix**, or **Zeus Prime** at cane burning time



Conclusions

- No difference in **fruit size or yield** among any of the treatments
- These products remain **high priority** for registration in caneberries
 - **Alion** and **Treevix** in IR-4 testing during 2014 and 2015
 - FMC has registered **Zeus** and **Zeus Prime**
 - **Stinger** and **Trellis** were included in IR-4 in 2015

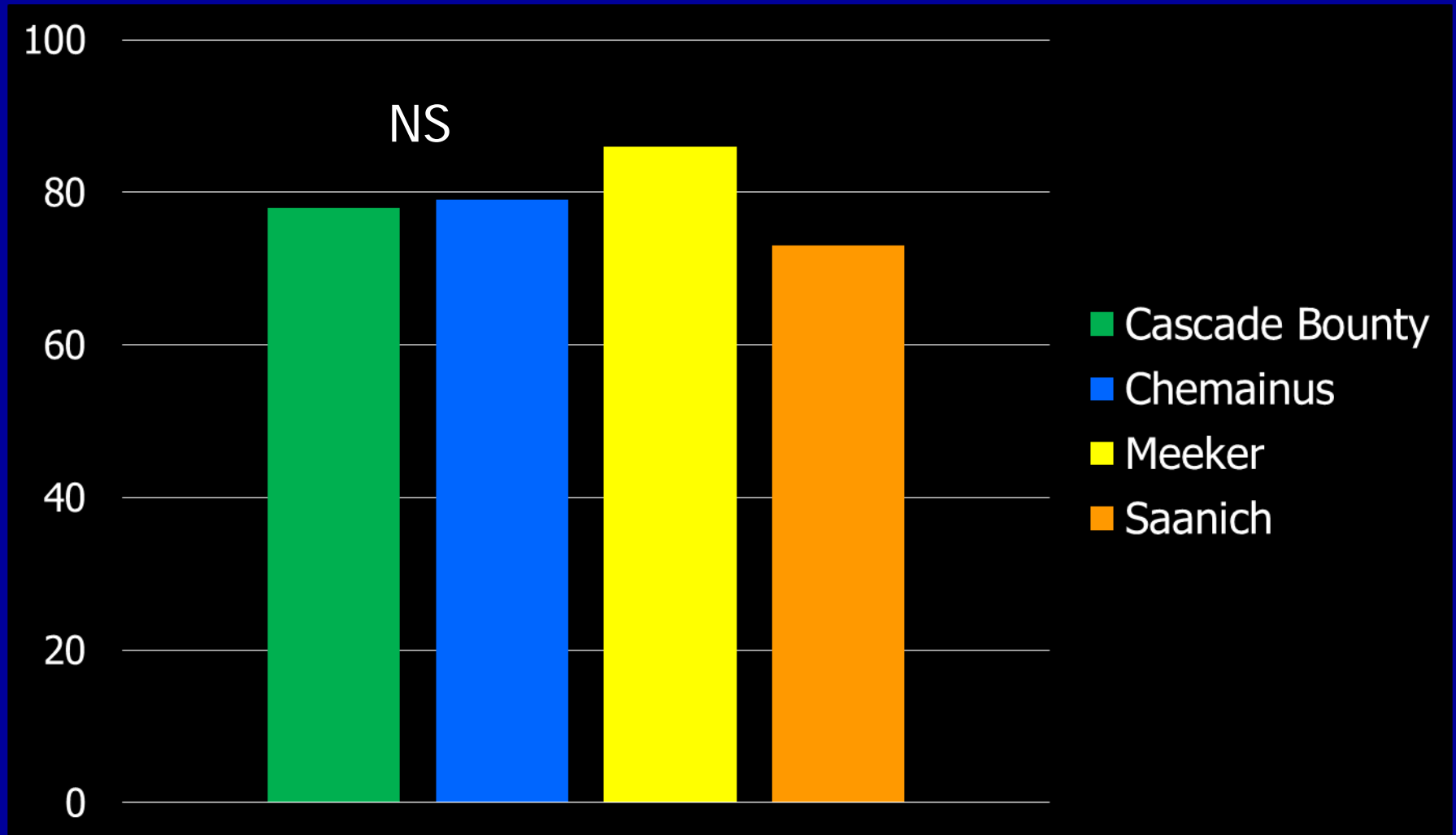
Cane Burning Effects on Raspberry

- Working with WSU scientists **Lisa Wasko DeVetter** and **Joan Davenport**
- Trials conducted at **Mount Vernon NWREC** and **Prosser IAREC**
- '**Meeker**', '**Chemainus**', '**Saanich**', '**Cascade Bounty**', and '**Wakefield**'
- Raspberry plants treated with **Goal**, **Aim** (applied once or twice), or **Treevix** at cane burning time

Primocane Burn

By Cultivar, 6 DAT, 2014

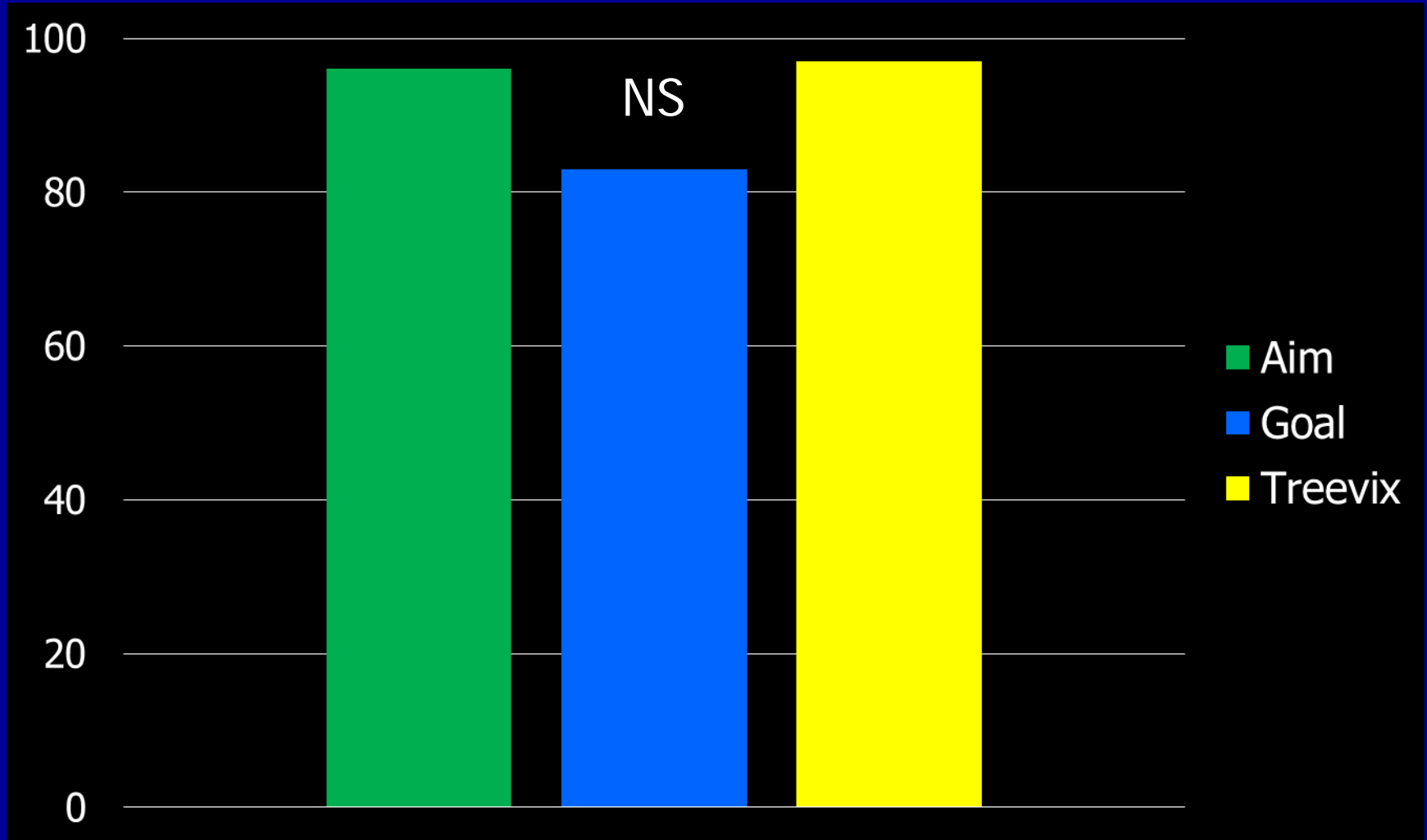
% Burn



Primocane Burn

By Herbicide, 6 DAT, 2014

% Burn



Raspberry at NWREC, 2015

Treatment/ Cultivar	Berry Size	Primocane Weight	Florican Weight	Fruiting Laterals
	g/berry	g/cane	g/cane	g/cane
Goal	3.9	23.9	67.7	62.1
Aim	3.9	23.8	67.6	74.5
Treevix	3.7	28.1	55.6	43.7
Nontreated	3.7	27.0	77.0	72.0
Cascade Bounty	3.6 bc	32.0	59.9	80.8
Chemainus	3.9 ab	23.6	67.3	43.3
Meeker	3.6 c	24.6	69.0	64.5
Saanich	4.2 a	22.6	71.7	63.7

Raspberry at IAREC, 2015

Treatment/ Cultivar	Primocane Weight	Florican Weight	Fruiting Laterals
	g/cane	g/cane	g/cane
Treevix	21.8	32.1	21.9
Aim once	21.2	25.8	26.5
Aim twice	20.9	26.0	30.8
Nontreated	22.1	25.5	28.3
Chemainus	23.2 a	25.4 ab	15.6 b
Meeker	15.0 b	37.7 a	23.8 b
Wakefield	26.4 a	19.0 b	41.2 a

Comparing Raspberry, Two Sites

Cultivar/ Location/ Treatment	Primocane Weight	Floricanes Weight	Fruiting Laterals
	g/cane	g/cane	g/cane
Chemainus	22.7	43.1	29.0
Meeker	19.9	51.4	39.1
IAREC	19.3 b	33.0 b	20.9 b
NWREC	23.9 a	66.2 a	51.8 a
Aim	22.7	44.9	40.6
Treevix	20.6	45.9	23.5
Nontreated	20.6	51.0	38.2

Fruit Quality Analyses

- Fruit samples **frozen** after harvest
- Crush berries in **liquid nitrogen**, then extract in **acidified methanol**
 - HPLC analyses for **organic acid** and **sugar** content
 - Spectrophotometric analyses for **anthocyanin** and **polyphenol** content
 - Measure juice **pH** and **°Brix**



Red Raspberry Trial

Scotland, 2012

Changes in Fruit Quality Due to Herbicide

	°Brix/pH	Polyphenols	Organic Acids	Sugars
Aim	0	+	0	0
Rely	0	+	0	0
Hand	0	+	0	0

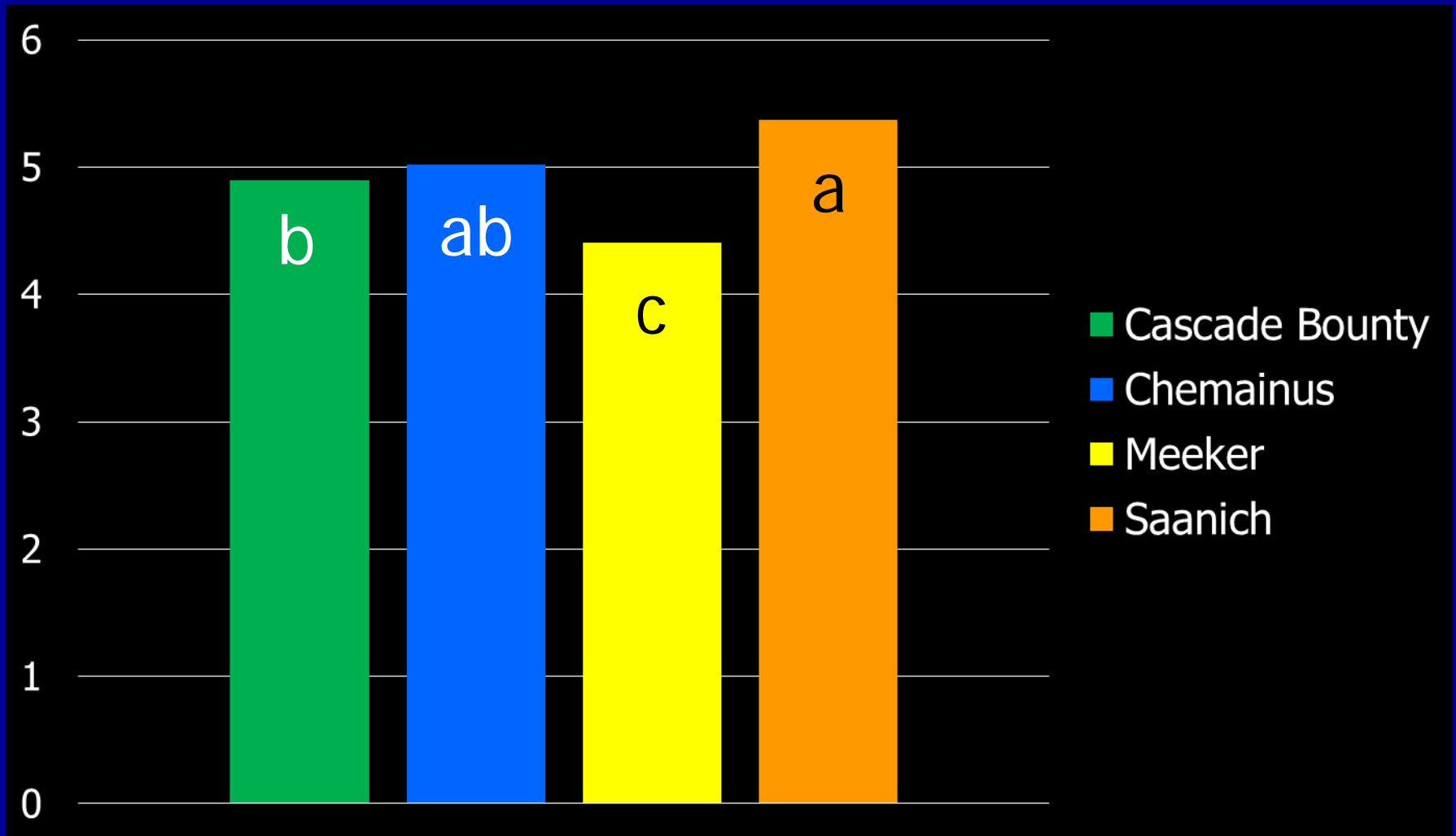
Changes in Fruit Quality Due Number of Applications

	°Brix/pH	Polyphenols	Organic Acids	Sugars
1	0	+	+	0
2	0	0	+	0
3	0	+	+	0

Berry Weight

50 Berries, by Cultivar, 2014

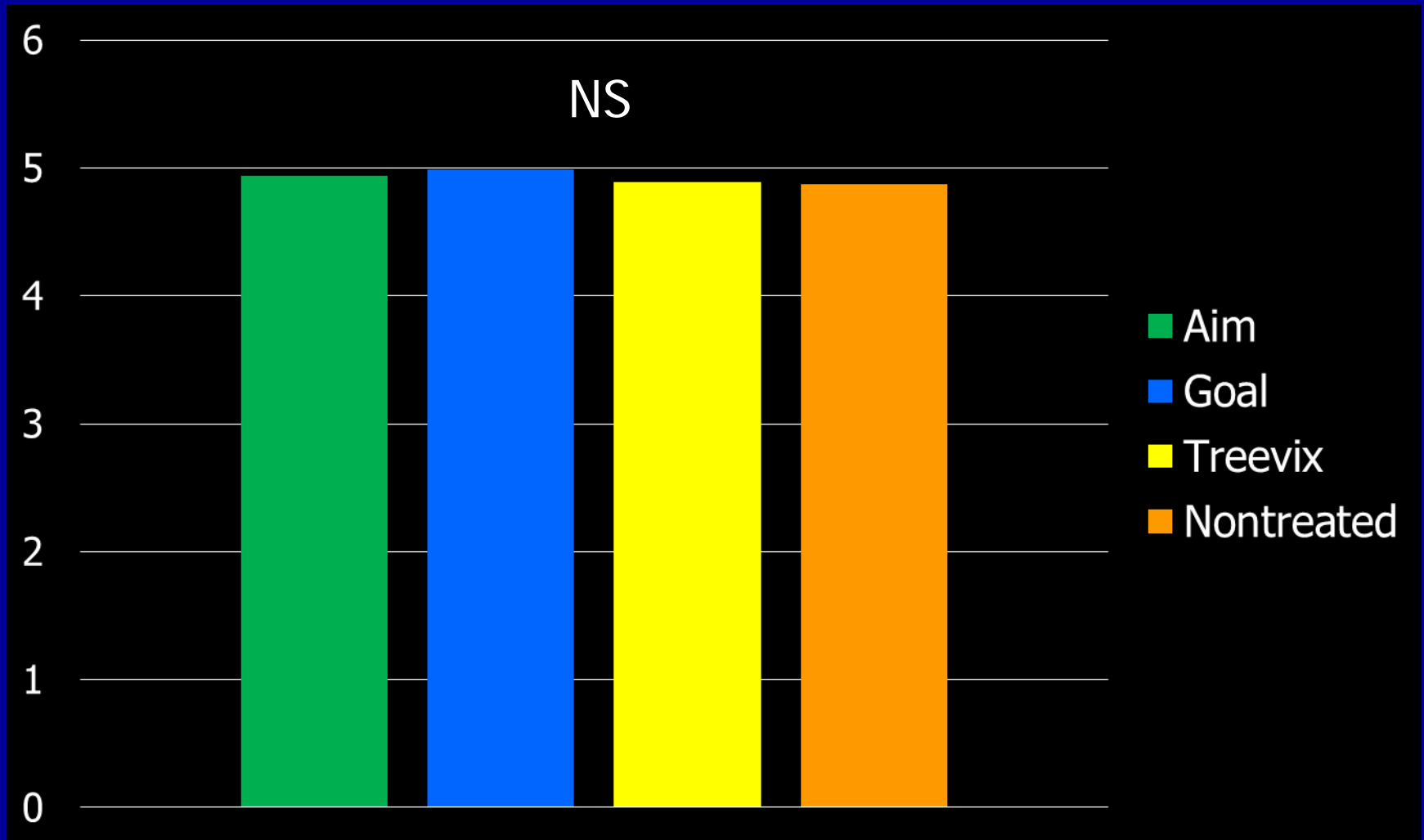
g/berry



Berry Weight

50 Berries, by Herbicide, 2015

g/berry



Preliminary Conclusions

- Still too preliminary to even be called preliminary...
- Plants were 2 years old at IAREC and fully established at NWREC, which likely accounts for differential growth seen at the two sites
- Floricane effects at IAREC may not fully reflect cane burning herbicides, since they were first applied this season
- Berry quality and cane carbohydrate data on the way

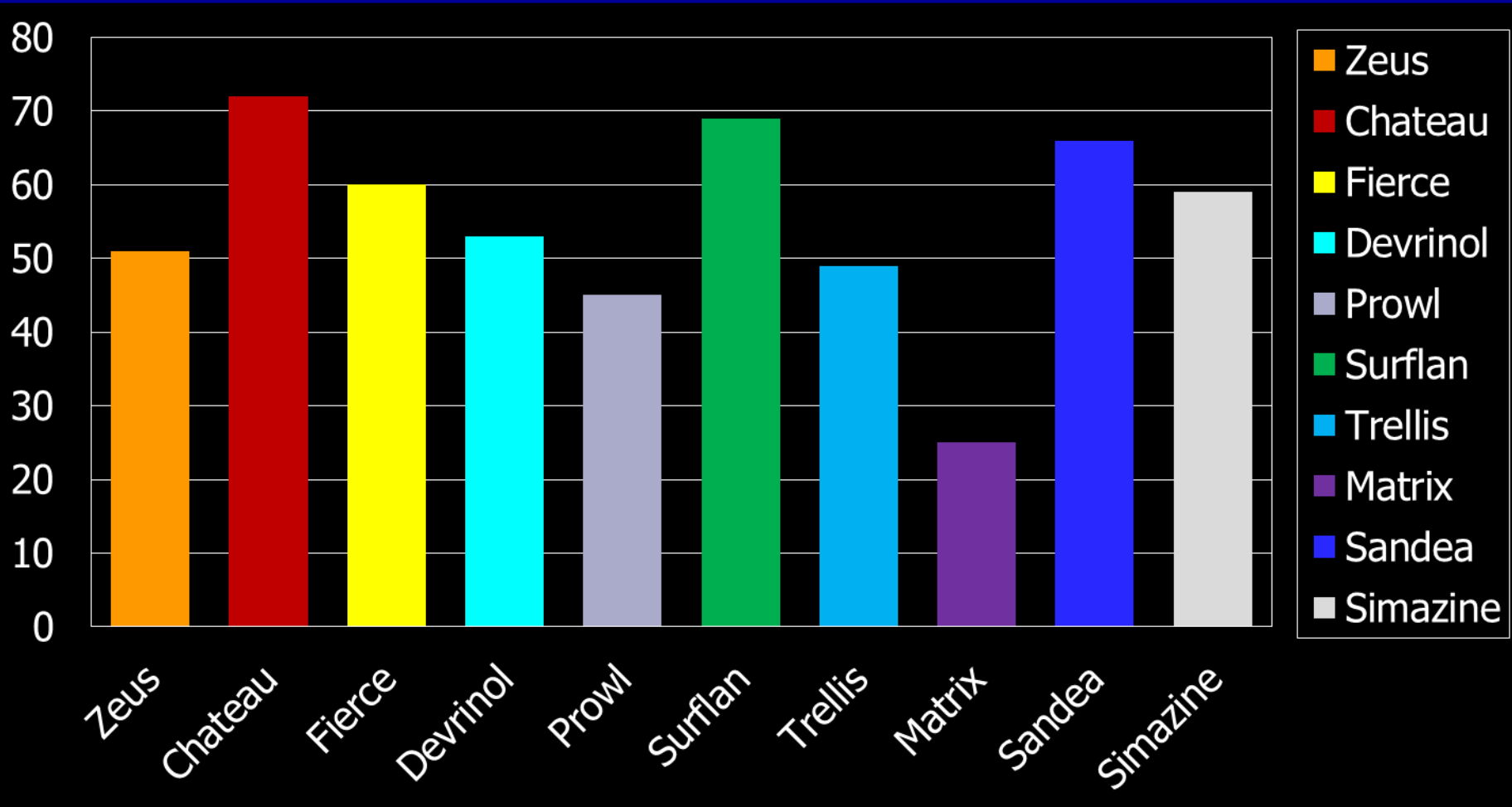
Baby Raspberry Herbicide Trial

- This trial was conducted in at NWREC during 2015
- Plant material generously donated by **NorCal Nursery** and **Northwest Plant**
 - 'Meeker' roots and 'Chemainus' and 'Wakefield' tissue culture plants
- Herbicides included **Zeus**, **Chateau** (flumioxazin), **Fierce** (flumioxazin + pyroxasulfone), **Devrinol**, **Prowl H2O**, **Surflan**, **Trellis** (= Gallery), **Matrix**, **Sandea**, and **simazine**
 - Treatments applied immediately POSTR
- Two plantings were included in the trial (June 5 and 11, 2015)
- ***Neither trial received supplemental irrigation***

Weed Control

September

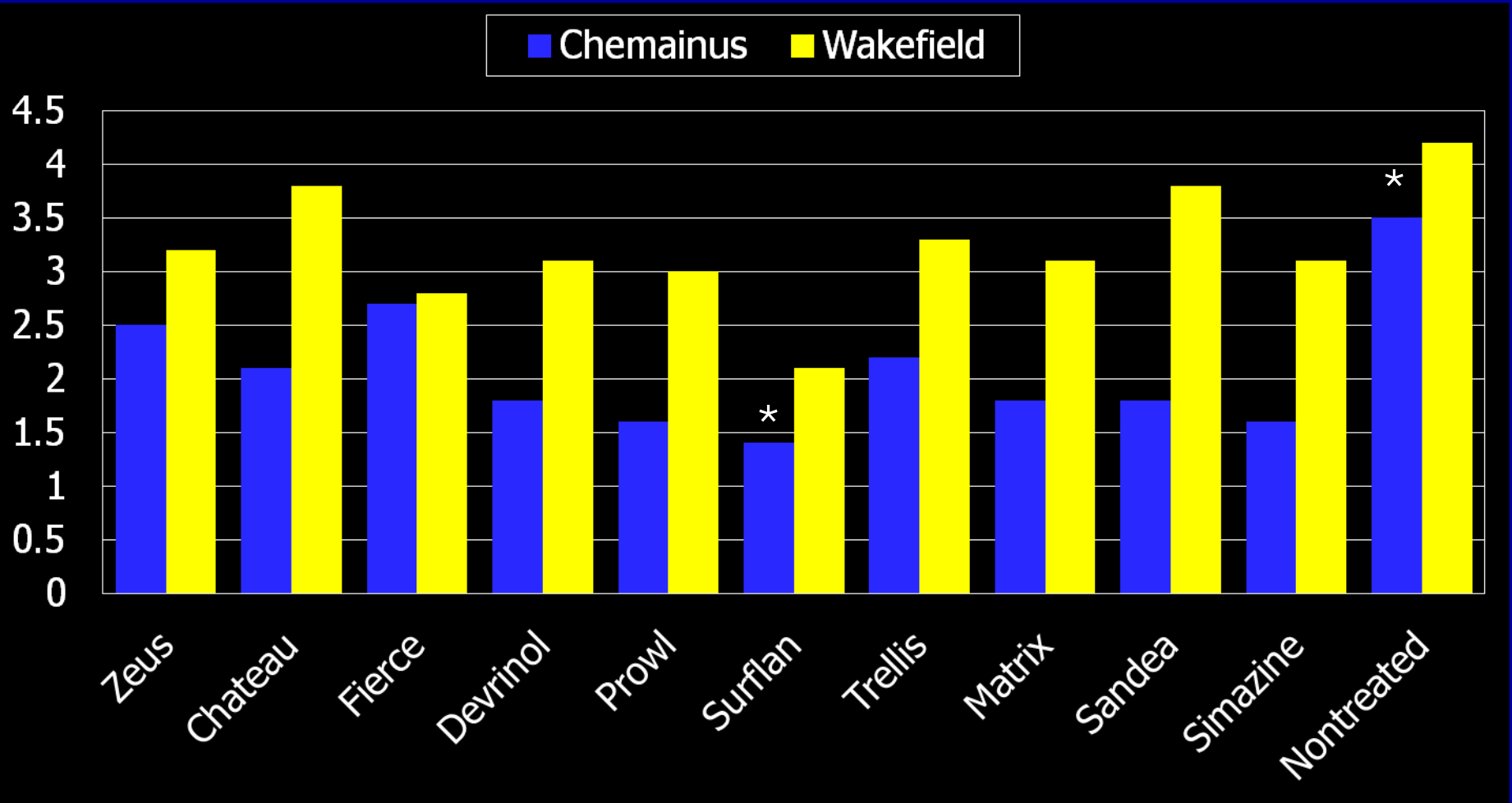
%



Mean Shoot Number

TC Plants, December

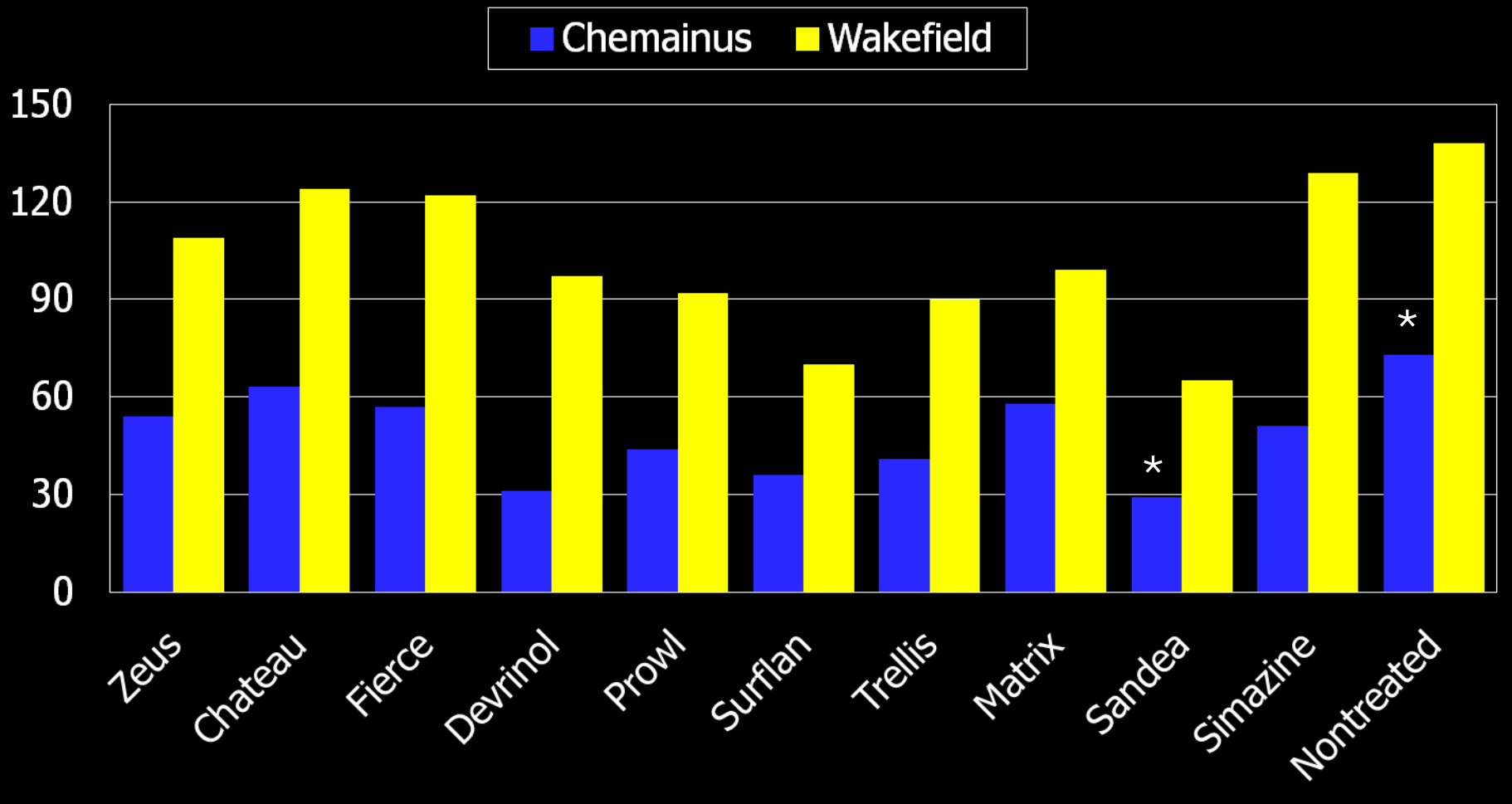
shoots/plant



Mean Shoot Length

TC Plants, December

cm



Conclusions

- Weed control and raspberry growth were likely both affected by dry, warm conditions during 2015
- TC plants and roots generally responded similarly to these herbicides
- Surflan reduced shoot number and Sandea reduced shoot length in 'Chemainus'
- Plants will be re-treated in 2016



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