

Potential for Phytotoxicity of
Endorse 11.3 DF (Polyoxin D)
On Coneflower
(*Rudbeckia fulgida* 'Goldstrum')

By

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Project: Interregional Research Project #4
Project Number 22699A – November 3, 2004

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TRIAL:	1
DATE:	11/3/04

IR-4 ORNAMENTAL DATA REPORTING FORM

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Location of Trial	University of California, Davis CA
TRIAL TYPE: (field, container, greenhouse, etc)	Greenhouse
Chemical - Common Name	Polyoxin D
- Formulation	DF, 11.3% a.i./gal
- Batch Number	
- Product	Endorse 11.3 DF
- EPA Registration Number	
- Manufacturer	Cleary
USE INFORMATION	
- Plant Common Name	Coneflower
- Plant Scientific Name	<i>Rudbeckia fulgida</i> 'Goldstrum'
- Pest (s)	Bacterial diseases
Soil Type or Type of Potting Mix:	UC Mix a)%Sand: 30 b)%Silt: c)%Clay: d)%OM: 70 e)pH: 6.5
Enter each DATE for:	Seedling: Emergence: Transplanting: 4/18/04
Enter each SPACING for:	Plant or Pot: 6 inches Row: 6 inches
Enter each SIZE for:	Pot: 6-inch Plot: 50 sq ft
Experimental Design:	Randomized complete block (3 blocks X 3 reps)
Number of Reps:	9 reps total for each treatment

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APPLICATION PARAMETERS

Type of Application: (aerial, ground, foliar, drench, ppi, chemigation, broadcast, directed, etc)	Foliar spray
Number of Applications:	4, 14 days apart
Application Type:	Manual spray bottle
Nozzle Type/Size:	
Nozzle Pressure:	
Delivery Rate:	
Calibration Date(s):	

APPLICATION SUMMARY

APPLICATION DATE	RATES (a.i./A) (Be sure to provide units)	Brief Description of Growth Stage (Dormant, New Growth Present, Bud, etc)
9/8/04	0, 3.5,7.0,14.0 oz./100 gal	20 weeks post- transplant, actively growing
9/22/04	0, 3.5,7.0,14.0 oz./100 gal	22 weeks post- transplant, actively growing
10/6/04	0, 3.5,7.0,14.0 oz./100 gal	24 weeks post- transplant, actively growing
10/20/04	0, 3.5,7.0,14.0 oz./100 gal	26 weeks post- transplant, actively growing

RAINFALL/IRRIGATION RECORDS

See Table 1

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OTHER PESTICIDES, FERTILIZER, LIME AND ADJUVANTS USED:

PRODUCT	AMOUNT	DATE
Flagship	47 g/12,000 sq. ft.	9/04
Talstar	0.64 oz.	10/04
Pedestal	0.32 oz.	10/04
Azatin	1.0 oz.	10/04
Avid	0.32 oz.	10/04
Flagship	46 g	10/04

NARRATIVE SUMMARY OF METHODS AND RESULTS: (Use more pages if needed)

Materials and Methods

Plant Material and Culture. Young plants of *Rudbeckia fulgida* 'Goldstrum' were received from Yoder Bros. on April 12, 2004. These were transplanted to 4-inch pots containing UC Mix on April 30, 2004 and maintained in a greenhouse under natural day length for 5 months during which time the plants were repotted into 6-inch pots containing UC Mix. The experiment began on September 8, 2004. During the 8-week experiment, the plants were maintained in a greenhouse under natural day length and day/night temperatures of 78°/65° F (26°/18° C) (Figure 1). The plants were watered as needed (at least once daily) during the 8-week experiment with half-strength Hoagland's solution. Pesticides were applied as part of a normal pest management program (see above).

Experimental Procedure. Thirty-six plants were randomly chosen and individually tagged for treatment with 0, 3.5 oz/100 gal (1X), 7.0 oz/100 gal (2X) or 14.0 oz/100 gal (4X) Endorse 11.3 DF (Polyoxin D) with 9 replicates per treatment. These dosages were prescribed in IR4 Ornamental Protocol 640 dated 3/04 (Appendix A). The plants received the first of 4 foliar spray applications of the material on September 8, 2004. The subsequent 3 applications were made at 14-day intervals on September 22, October 6 and October 20, 2004. The plants were arranged in a randomized complete block design with 3 blocks and 3 treatment replicates per block. Phytotoxicity ratings and plant height measurements were taken at days 0, 14, 28, 42 and 56 (November 3, 2004). Visual phytotoxicity evaluations were based on a numerical rating scale ranging from 0 (no injury) to 10 (complete kill) (Table 1). Plant height (cm) was measured from the container soil surface to the top of the canopy.

Statistical Analysis. For each variable, the change in the variable from the start of the experiment was computed. Statistical analyses were carried out on these variables to determine if the application of herbicide affected growth and phytotoxicity index values.

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Results

After the start of the experiment all phytotoxicity index value observations were around 0 with significant increases after that, increasing to between 2.8 and 4 by week 8 (Table 2, Figures 2 and 3, Appendix B). This increase is due to cultural conditions; no significant differences were observed between treatments. These elevated levels throughout the experiment were due to leaf chlorosis and marginal necrosis probably resulting from salinity buildup in the container medium.

During the 8 weeks of the experiment Rudbeckia did not grow in height in any of the 4 treatments (Table 2, Figures 2 and 4, Appendix C). There were no significant differences in growth between treatments at any of the observations.

Discussion

Polyoxin D did not result in foliar phytotoxicity symptoms in Rudbeckia. It also did not result in any height reduction.

GOOD RESEARCH PRACTICE STATEMENT:

I acknowledge that I have read and followed the IR-4 Research protocol and completed this trial following good agricultural practice, or reported any deviations (note any changes from authorized protocol in narrative).

SIGNATURE (PRINCIPAL INVESTIGATOR) _____

Date Completed:

If submitted, using e-mail, please provide e-mail address and send confirming receipt.

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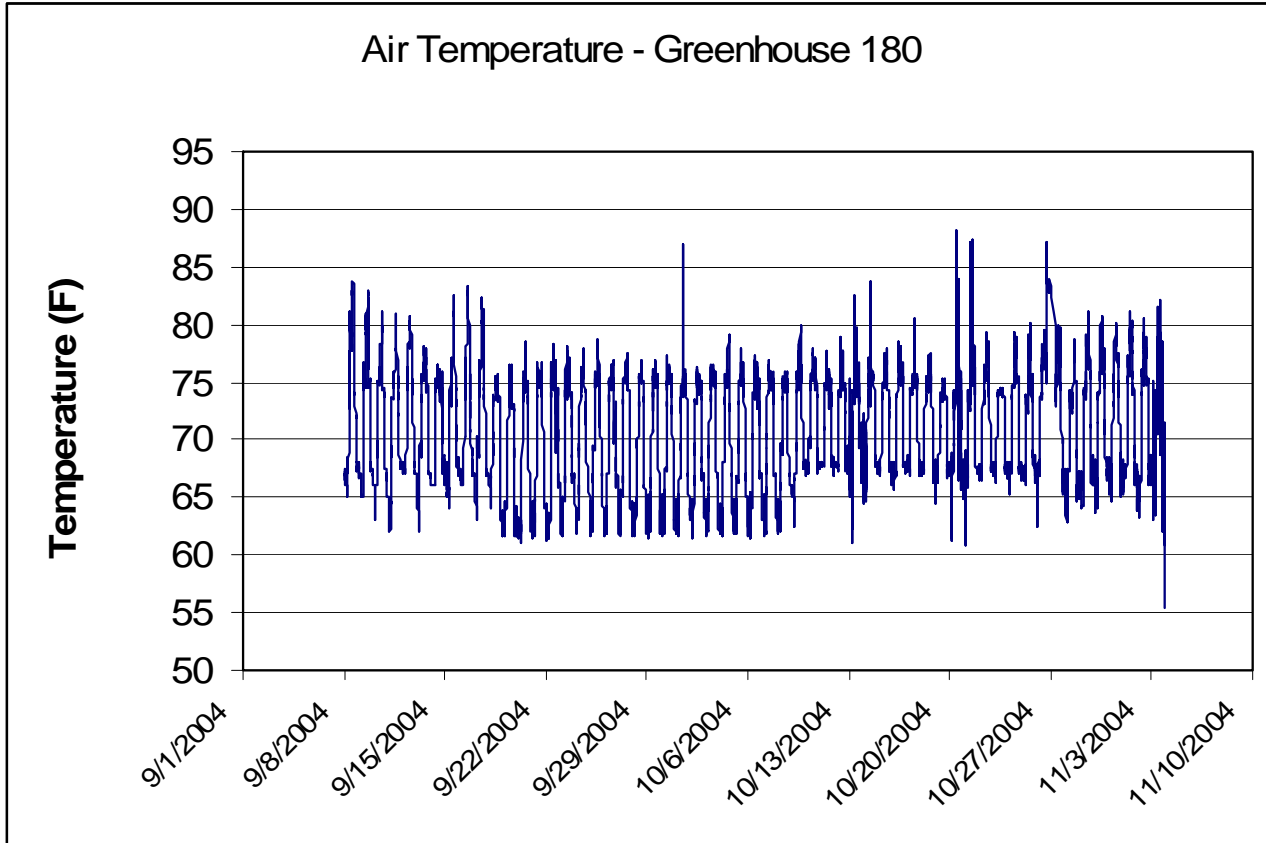


Figure 1. Greenhouse temperatures during the phytotoxicity trial of Endorse 11.3 DF on *Rudbeckia fulgida* 'Goldstrum'.

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Table 1. Numerical plant damage rating scale used for phytotoxicity determinations.

Rating	Description of plant damage
0	No damage
1	No visible damage but unintended (non-permanent) impact
2	Slight leaf/tissue damage (curling leaves, necrosis, etc.)
3	Marginal chlorosis on some leaves (damage on up to 10% of plant)
4	10% – 20% of plant damaged
5	Significant damage to much of plant (30% - 40%)
6	40% – 60% of plant damaged
7	Chlorosis or necrosis on most of plant (60% - 70%)
8	Abscised leaves, branch dieback
9	Tissue severely damaged (80% - 100% of plant)
10	Complete kill

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Table 2. Summary of results for *Rudbeckia fulgida* 'Goldstrum' treated with 0, 3.5, 7.0 or 14.0 oz./100 gal Endorse 11.3 DF. Cumulative changes over time are reported for phytotoxicity index and plant height. Different letters within a column indicate significant differences between treatments (P < 0.05). "Yes"/"No" refers to significant treatment effects at the 5% level. Means ± SE (n = 9).

Material: Polyoxin

Phytotoxicity Increase after:

Treatment	2 weeks	no	4 weeks	no	6 weeks	no	8 weeks	no
Control	0.89 ± 0.35	a	1.22 ± 0.49	a	2.33 ± 0.50	a	3.00 ± 0.58	a
1x	1.22 ± 0.32	a	1.44 ± 0.29	a	2.56 ± 0.34	a	2.78 ± 0.43	a
2x	1.67 ± 0.24	a	2.33 ± 0.33	a	3.56 ± 0.24	a	4.00 ± 0.33	a
4x	1.33 ± 0.44	a	2.00 ± 0.65	a	3.00 ± 0.62	a	3.33 ± 0.65	a

Height Increase after:

Treatment	2 weeks	no	4 weeks	no	6 weeks	no	8 weeks	no
Control	-4.72 ± 6.15	a	3.89 ± 2.53	a	0.33 ± 5.41	a	-1.78 ± 5.52	a
1x	-1.61 ± 0.92	a	2.06 ± 0.88	a	1.83 ± 1.58	a	0.50 ± 1.31	a
2x	-1.39 ± 1.61	a	4.00 ± 2.82	a	4.11 ± 2.96	a	2.61 ± 3.02	a
4x	-1.06 ± 0.61	a	-0.50 ± 1.35	a	-0.61 ± 2.22	a	-1.06 ± 1.16	a

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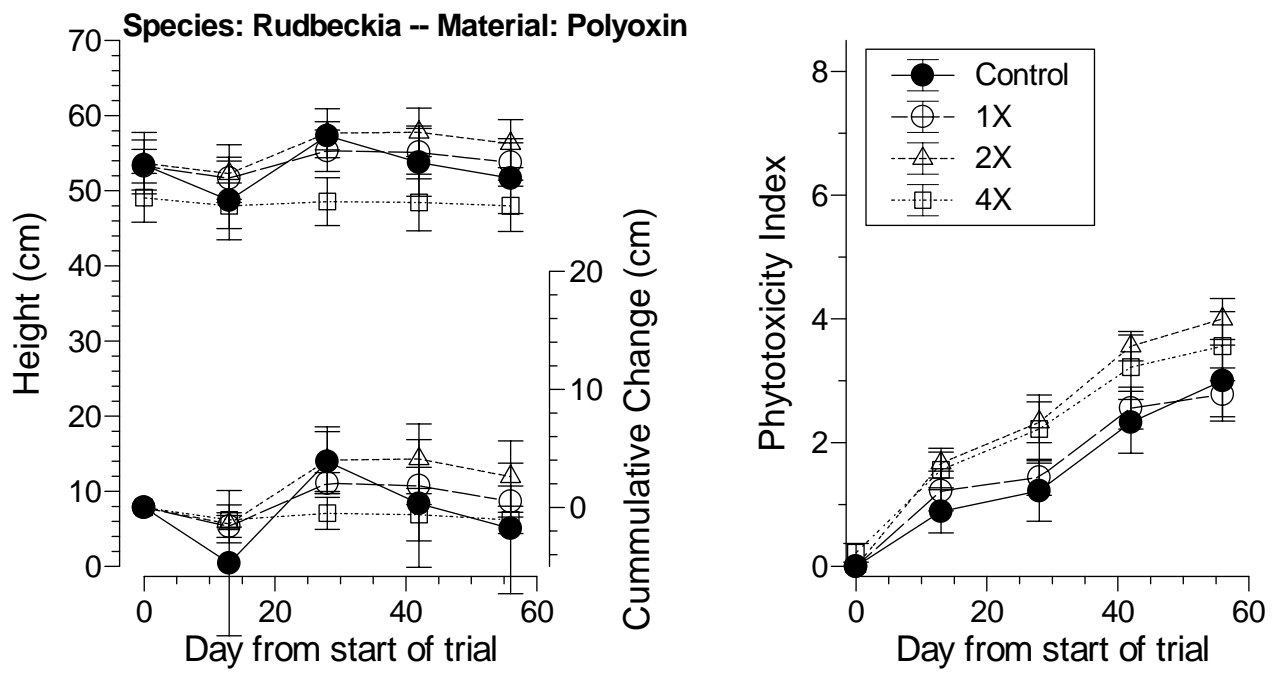


Figure 2. Summary of results for *Rudbeckia fulgida* 'Goldstrum' treated with 0, 3.5, 7.0 or 14.0 oz./100 gal Endorse 11.3 DF. Mean heights as well as mean cumulative changes in height are shown along with standard errors of the means. For phytotoxicity index, the mean values and standard error bars are shown (n = 9).

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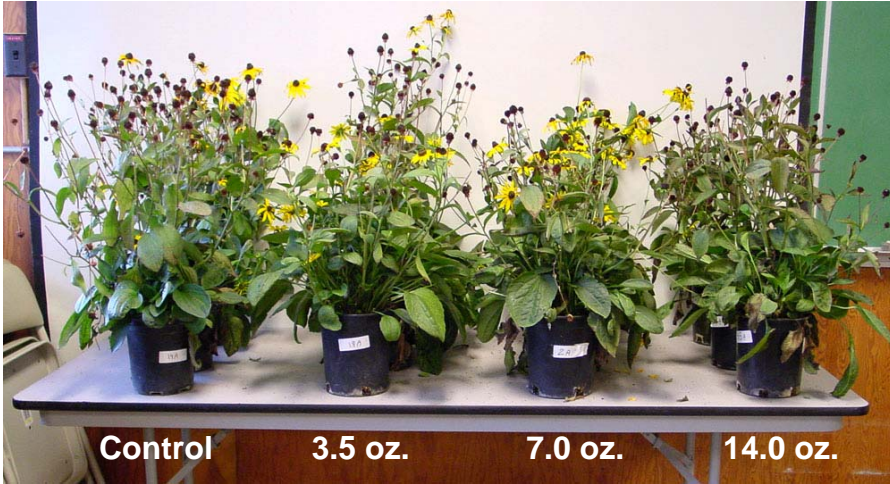
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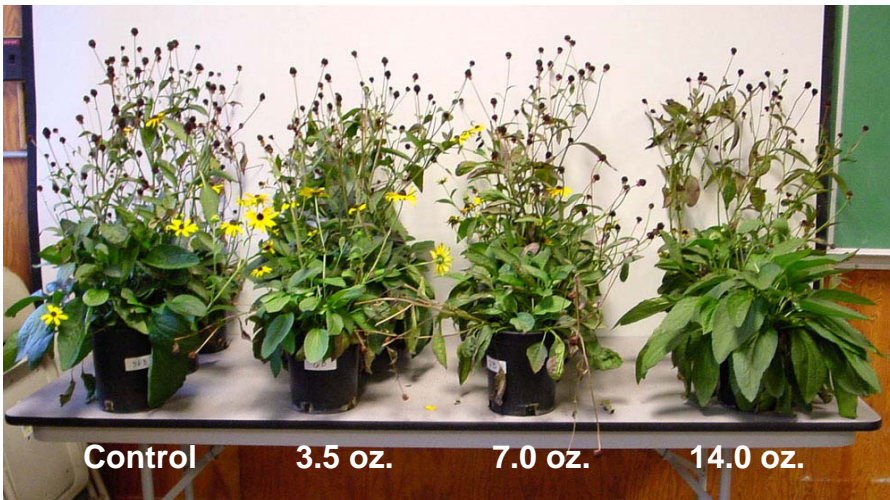
Figure 3. Damage symptoms seen on *Rudbeckia fulgida* 'Goldstrum' plants treated with 0, 3.5, 7.0 or 14.0 oz./100 gal Endorse 11.3 DF. Symptoms included spotty chlorosis on leaves (upper left), marginal leaf necrosis (upper right) and necrotic spotting on leaves (lower left).

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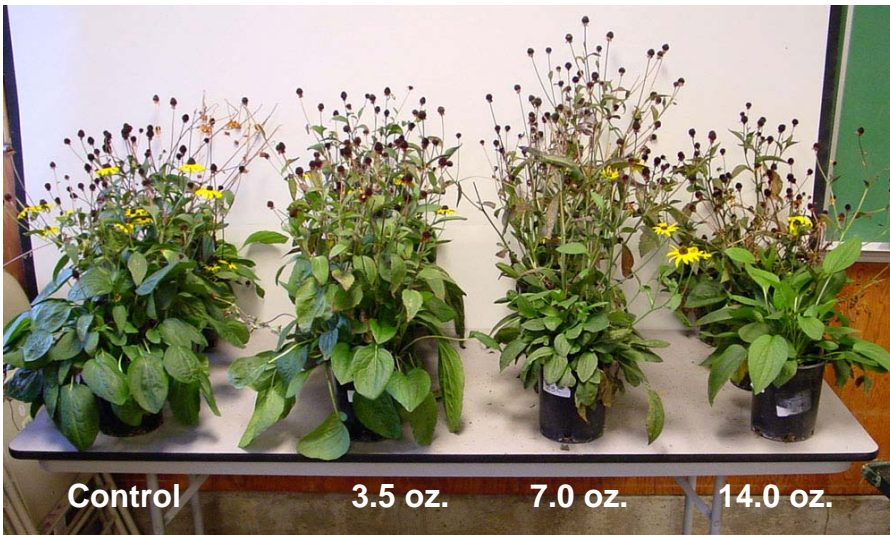
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Block A



Block B



Block C

Figure 4. *Rudbeckia fulgida* 'Goldstrum' plants 8 weeks after 4 applications of 0, 3.5, 7.0 or 14.0 oz./100 gal Endorse 11.3 DF. Applications were made at Weeks 0, 2, 4 and 6.

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APPENDIX B: PHYTOTOXICITY REPORT FORM: Visual Rating

Rudbeckia- phyto trial with Polyoxin D				9/8/2004	9/21/2004	10/6/2004	10/20/2004	11/3/2004
Treatment	Rate oz./100gal	Block	Rep	Phyto Rating	Phyto Rating	Phyto Rating	Phyto Rating	Phyto Rating
Control	0	A	1	0	0	0	1	2
Control	0	A	2	0	0	1	3	4
Control	0	A	3	0	2	4	4	5
Control	0	B	1	0	0	0	2	3
Control	0	B	2	0	2	2	4	4
Control	0	B	3	0	2	3	4	5
Control	0	C	1	0	2	1	2	3
Control	0	C	2	0	0	0	0	0
Control	0	C	3	0	0	0	1	1
1x	3.5	A	1	0	2	3	3	3
1x	3.5	A	2	0	0	0	1	1
1x	3.5	A	3	0	2	1	3	3
1x	3.5	B	1	0	2	2	3	3
1x	3.5	B	2	0	2	2	3	5
1x	3.5	B	3	0	0	1	3	3
1x	3.5	C	1	0	1	1	2	2
1x	3.5	C	2	0	0	1	1	1
1x	3.5	C	3	0	2	2	4	4
2x	7	A	1	0	2	3	4	5
2x	7	A	2	0	0	0	2	2
2x	7	A	3	0	2	3	3	4
2x	7	B	1	0	2	3	3	3
2x	7	B	2	0	2	3	4	4
2x	7	B	3	0	2	3	4	5
2x	7	C	1	0	1	2	4	5
2x	7	C	2	0	2	2	4	4
2x	7	C	3	0	2	2	4	4
4x	14	A	1	0	2	4	4	5
4x	14	A	2	0	2	4	5	5
4x	14	A	3	0	2	4	4	5
4x	14	B	1	1	0	0	1	1
4x	14	B	2	0	2	2	3	3
4x	14	B	3	0	2	3	5	5
4x	14	C	1	0	2	2	4	4
4x	14	C	2	0	2	0	1	1
4x	14	C	3	1	0	1	2	3

**NOTE: DEFINE MEASUREMENT OF PHYTOTOXICITY, OR INDEX OF INJURY (0=NO INJURY, 10=COMPLETE KILL)
See Table 2**

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APPENDIX C: PHYTOTOXICITY REPORT FORM: Plant Height (cm)

Rudbeckia- phyto trial with Polyoxin D				9/8/2004	9/21/2004	10/6/2004	10/20/2004	11/3/2004
Treatment	Rate oz./100gal	Block	Rep	Plant Height (cm)	Plant Height (cm)	Plant Height (cm)	Plant Height (cm)	Plant Height (cm)
Control	0	A	1	51	47	56	60	63
Control	0	A	2	57	57	57	59	57
Control	0	A	3	57	55.5	60	63	63
Control	0	B	1	31.5	51	55	53	52
Control	0	B	2	66	63	66	67	64
Control	0	B	3	60	60	63	60	59
Control	0	C	1	48.5	45	49	51	45
Control	0	C	2	60	10	60	21	21
Control	0	C	3	50	50	50	50	41
1x	3.5	A	1	55	51	55	54	54
1x	3.5	A	2	65.5	70.5	74	79	76
1x	3.5	A	3	45	42	47	44	46
1x	3.5	B	1	45.5	45	46	45	44
1x	3.5	B	2	55.5	52	56	55	56
1x	3.5	B	3	60	58	60	60	57
1x	3.5	C	1	50	49	52	51	50
1x	3.5	C	2	49	47	52	49	48
1x	3.5	C	3	54	50.5	56	59	53
2x	7	A	1	50	46	52	52	49
2x	7	A	2	39	50	65	66	65
2x	7	A	3	46	43	50	48	48
2x	7	B	1	66	62	65	65	63
2x	7	B	2	34	30	38	40	38
2x	7	B	3	58.5	54	59	58	59
2x	7	C	1	70	68	71	71	68
2x	7	C	2	58	57	59	60	57.5
2x	7	C	3	61.5	60.5	60	60	59
4x	14	A	1	55	53	53	55	56
4x	14	A	2	56	55	58	60	56
4x	14	A	3	51	50	52	52	52
4x	14	B	1	28	29	32	31	30
4x	14	B	2	51	50	50	52	44
4x	14	B	3	60	58	62	62	63
4x	14	C	1	51.5	447	50	51	49.5
4x	14	C	2	50	52	40	32	44
4x	14	C	3	39	38	40	41	37.5