Vegetable Crop Update

A newsletter for commercial potato and vegetable growers prepared by the University of Wisconsin-Madison vegetable research and extension specialists

UW Extension

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Calendar of Events

July 14, 2016 – UW-Rhinelander Agricultural Research Station Field Day
July 21, 2016 – UWEX Langlade County –Antigo Research Station Field Day
July 28, 2016 – UW-Hancock Agricultural Research Station Field Day

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Veg Pathology Webpage: http://www.plantpath.wisc.edu/wivegdis/.

National Late Blight Updates (www.usablight.org). No new detections of late blight have been made in the past week. However, an older report (from 4/28/16) of US-11 on potato in southern CA has been updated to the site. US-11 can infect both tomato and potato, is of the A1 mating type, and is resistant to Ridomil. Earlier this season, there were a few cases confirmed in FL (tomato, potato, US-23), SC (tomato), and now posted, CA (potato, US-11). US-23 has predominated over the past few years in tomato and potato late blight epidemics across the U.S. As a reminder, US-23 is a genotype that can be controlled with mefenoxam/metalaxyl fungicides (ie: Ridomil Gold SL); this type can infect both tomato and potato.

Cucurbit Downy Mildew Updates (http://cdm.ipmpipe.org/). Just yesterday, there was a new report of cantaloupe downy mildew from northern FL (Alachua Co.). Prior to that time, there were two detections of cucurbit downy mildew in the southeastern U.S.: Levy Co. FL on watermelon and Dodge Co. GA on cucumber. Earlier season detections (Mar and Apr) came from multiple cucurbit crops in southern TX, FL, and GA.

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The importance of plant nutrition when overcoming stress: There is great concern with the planted potato crop due to freezing temperatures last weekend. However, damage to the plant is related to how much plant growth has occurred. For example, I planted potatoes on April 20th and applied the first nitrogen application on May 13th along with first hilling. The potatoes had not fully emerged and are only now cracking. No frost or freezing damage is expected for these plants. But this does bring up an important issue for those that plant early and may be subject to freezing stress on the plants. For these farmers, it is incredibly important that adequate phosphorus, potassium, sulfur, and micronutrients are applied pre-plant or with starter. If a plant is trying to overcome some stress, having non-limiting nutrient conditions is essential for healthy plant growth. Of course it is always important to apply adequate amounts of P, K, S, and micronutrients, but even more important when the plant is overcoming stress. In this scenario, I'm also assuming two things: 1) soil tests are frequently obtained from the field to guide fertilizer applications and 2) nitrogen is applied over three or more times during the growing season to further limit any N stress to the plant.

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Keeping special pesticide registrations in mind when planning specialty crop pest management: New and localized pest problems can be extremely challenging in specialty crop production. In response, researchers, pesticide registrants and the Wisconsin DATCP often work together to get time-limited special pesticide registrations or permits to address these situations. These rather dire pest situations, however, are a subject of many grower questions during this time of year. What special labels are available in Wisconsin and for which crops? Did the special label that I used last year expire or can I still use the pesticide?

The Wisconsin DATCP has combined all of the relevant information to answer these and other questions into a useful table that is accessible online at: http://datcp.wi.gov/Plants/Pesticides/Special_Registrations/. From this web page, simply click on "Wisconsin Special Registration Pesticide Listing". The table includes the pesticide name, specific pest situations and crop sites that are addressed by the special label and the valid dates for use, among other information. Additionally, clicking on the product name will open a copy of the Wisconsin label.

There are two types of special pesticide labels often found on this page: Special Local Need Registrations (Section 24c) and Emergency Exemptions (Section 18). The section numbers refer to parts of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) that dictate how the federal Environmental Protection Agency (EPA) regulates pesticide use. These sections recognize that localized outbreaks and emergency situations require a rapid pesticide registration process to address the need. The type depends on the pest situation:

- Special Local Need (24c) registrations are issued by the state and reviewed by EPA for a demonstrated special local pest management need. In most cases a pesticide tolerance in the harvested product or exemption from a tolerance has been established. These registrations are often valid for longer than Emergency Exemptions.
- Emergency Exemptions (Section 18) are requested from EPA by DATCP to permit an unregistered use of a pesticide and typically are valid for only up to one year. The Emergency Exemption addresses urgent, non-routine pest problems that jeopardize agricultural production and aren't managed by current options.

These tools can be very valuable components of an integrated pest management program in specialty crops where pest outbreaks are often unpredictable. Even more so than typical pesticide labels, special labels change often and are time-limited! As always, read and follow the label prior to use!

For further information on common diseases, insect and weed pest information, please consider the 2016 A3422 Commercial Vegetable Production in Wisconsin guide is available for purchase ($10) through the University of Wisconsin Extension Learning Store website: http://learningstore.uwex.edu/Commercial-Vegetable-Production-in-Wisconsin2016-P540.aspx

A pdf of the document can be downloaded for free at the following direct link: http://learningstore.uwex.edu/Assets/pdfs/A3422.pdf

Evaluation of foliar fungicides for control of potato early blight in Wisconsin, 2015. A.J. Gevens & S.A. Jordan, UW-Plant Pathology.

A field trial was conducted at the UW Agricultural Research Station in Hancock to evaluate fungicide programs for control of foliar blights on potato. A total of 44 treatments were included for early blight and late blight control. Seed pieces, approximately 2 oz in size, were cut mechanically from US#1 'Russet Burbank' tubers on 20 Apr. Seed pieces were allowed to heal prior to planting on 30 Apr. No seed treatments were applied unless noted in the table. A randomized complete block design with four replications was used for the trial, and treatment plots consisted of four 24-ft-long rows spaced 36 in. apart with 12 in. spacing in the row. To minimize soil compaction and damage to plants in the treatment rows, drive rows for pesticide application equipment were placed adjacent to the plots. Fungicide treatments were initiated on 1 Jul after the P-day value (generated from a crop physiological model used for early blight prediction and fungicide initiation) reached 300. Subsequent applications were applied on a weekly basis to all four rows of each plot on the following dates: 8 Jul, 15 Jul, 22 Jul, 29 Jul, 5 Aug, 12 Aug, 19 Aug, 26 Aug, and 2 Sep for a total of ten fungicide applications. Vine kill was initiated on 27 Aug with an application of Diquat E 1.5 pt/acre followed by a second application on 2 Sep. Treatments were applied with a plot sprayer consisting of a tractor-mounted boom, pressurized with an air compressor, using TeeJet Hollow Disc Cone D3-23 nozzles (16 nozzles at 8-in. spacing). Fungicides were applied at a rate equivalent to 35 gal water/A at 40 psi. Plots were not inoculated but relied on natural dispersal of inocula for disease establishment. Early blight severity across 20 ft of the two center rows was rated on 10 Jul, 28 Jul, 11 Aug, 17 Aug, and 25 Aug using the Horsfall-Barratt rating scale (0-11 rating with 0=no disease, 11=100% disease severity). The Area Under the Disease Progress Curve (AUDPC) was determined by trapezoidal integration and then converted into Relative AUDPC (RAUDPC), i.e. percentage of the maximum possible AUDPC for the whole period of the experiment. Plots were harvested and graded on 24 Sep. A subset of 12 tubers from each plot was tested for specific gravity at time of grading. Total precipitation in Hancock during the production season was 18.5 in. Supplemental irrigation was applied 38 times during the potato production season for an additional 15.5 in.

Early blight pressure was moderate and progressed later than typical for the production region. Late blight, while present in the growing region, was not observed in the trial. The average tuber specific gravity across treatments was 1.071 with no significant differences between treatments (data not shown). There were significant differences among treatments for marketable yield with 29 of the 44 treatments having significantly greater yield than the non-treated control. There were no significant differences in size B weight and cull weight (data not shown). All of the fungicide treatments controlled foliar early blight significantly better than the non-treated control. No phytotoxicity was noted with any of the treatment programs tested. Please see the summarized yield and disease data, below for each of the 44 fungicide programs.

Treatment Number, Treatment, and rate/A		Application Timing[x]	Marketable Yield (cwt/A)[y]		RAUDPC[z]	
1	Non-treated Control	NA	458.2	a	0.459	t
2	Luna Tranquility 500SC 1.0 fl oz/1000 ftrow	In Furrow	463.9	ab	0.324	n-r
3	Luna Tranquility 500SC 1.0 fl oz/1000 ftrow	In Furrow				
	Echo Zn 4.17L 2.12 pt	1,2,4,8				
	Priaxor 4.17SC 4.5 fl oz + Echo Zn 4.17L 2.12 pt	3,6				
	Endura 70WG 3.5 oz + Echo Zn 4.17L 2.12 pt	5,7				
	Dithane 75DF 2.0 lb + Super Tin 80WP 2.5 fl oz	9,10	487.7	a-i	0.188	ab
4	Moncoat MZ 7.5 DP 12.0 oz/cwt seed	At Plant				
	Bravo Zn 4.17F 2.12 pt	1,2,4,8				
	Priaxor 4.17SC 4.5 fl oz + Bravo Zn 4.17F 2.12 pt	3,6				
	Endura 70WG 3.5 oz + Bravo Zn 4.17F 2.12 pt	5,7				
	Dithane 75DF 2.0 lb + Super Tin 80WP 2.5 fl oz	9,10	468.0	a-d	0.266	e-k
5	Champ WG 4.0 lb	1-10	468.3	a-e	0.363	rs
6	Cueva 1.4 gal	1-10	477.0	a-g	0.357	q-s
7	Double Nickel LC 4.5 pt	1-10	475.1	a-f	0.373	s
8	Dithane 75DF 2.0 lb	1-10	508.4	a-k	0.330	o-s
9	Bravo Zn 4.17F 2.12 pt	1-10	519.4	c-l	0.315	l-r
10	Quadris 2.08SC 6.0 fl oz	1,3,5				
	Bravo Zn 4.17F 2.12 pt	2,4,6,7-10	523.1	d-l	0.314	k-q
11	Bravo WS 720SC 1.5 pt	1,3,5,7,9				
	Dithane 75DF 2.0 lb	2,4,6,8,10	529.6	f-l	0.304	j-p
12	Bravo Zn 4.17F 2.12 pt	1,2,4,8				
	Priaxor 4.17SC 4.5 fl oz + Bravo Zn 4.17F 2.12 pt	3,6				
	Endura 70WG 3.5 oz + Bravo Zn 4.17F 2.12 pt	5,7				
	Dithane 75DF 2.0 lb + Super Tin 80WP 2.5 fl oz	9,10	528.2	f-l	0.249	c-h
13	Bravo Zn 4.17F 2.12 pt	1,2,4,8				
	Quash 50WDG 2.5 oz + Bravo Zn 4.17F 2.12 pt	3,6				
	Endura 70WG 3.5 oz + Bravo Zn 4.17F 2.12 pt	5,7				
	Dithane 75DF 2.0 lb + Super Tin 80WP 2.5 fl oz	9,10	539.9	i-l	0.285	h-o
14	Bravo Zn 4.17F 2.12 pt	1				
	Priaxor 4.17SC 4.5 fl oz + Bravo Zn 4.17F 2.12 pt	3				
	Endura 70WG 3.5 oz + Bravo Zn 4.17F 2.12 pt	5				
	Revus Top + Bravo Zn 4.17F 2.12 pt	7				
	Dithane 75DF 2.0 lb + Super Tin 80WP 2.5 fl oz	9	549.2	j-l	0.281	h-n
15	Bravo Zn 4.17F 2.12 pt	1,2,4,8				
	Priaxor 4.17SC 4.5 fl oz + Bravo Zn 4.17F 2.12 pt	3,6				
	Quash 50WDG 2.5 oz + Bravo Zn 4.17F 2.12 pt	5,7				
	Dithane 75DF 2.0 lb + Super Tin 80WP 2.5 fl oz	9,10	539.6	i-l	0.262	d-j

16	Bravo Zn 4.17F 2.12 pt	1,2,4,8				
	Priaxor 4.17SC 4.5 fl oz + Bravo Zn 4.17F 2.12 pt	3,6				
	Endura 70WG 3.5 oz + Bravo Zn 4.17F 2.12 pt	5,7				
	Dithane 75DF 2.0 lb	9,10	530.7	f-l	0.252	c-i
17	Champ WG 4.0 lb	1,2,4,8,9,10				
	EF400 33.6 fl oz + BacStop 8 fl oz	3,6				
	Regalia 4.0 qt + Champ WG 4.0 lb	5,7	526.9	f-l	0.284	h-o
18	A19649 200SC 5.13 fl oz	1-10	553.8	kl	0.179	a
19	A20259 200SC 13.7 fl oz	1-10	522.5	d-l	0.201	ab
20	Luna Tranquility 500SC 11.2 fl oz	1-10	537.3	h-l	0.197	ab
21	Endura 70WG 4.5 oz	1-10	547.9	j-l	0.314	k-q
22	Quadris Top 2.71SC	1-10	538.8	i-l	0.200	ab
23	Bravo WS 720SC 1.5 pt	1,2,5-10				
	Quadris Top 2.71SC 10.0 fl oz	4,5	521.3	d-l	0.281	h-n
24	Bravo WS 720SC 1.5 pt	1,2,5-10				
	Inspire Super 2.82EW 20.0 fl oz	4,5	541.0	i-l	0.216	a-d
25	Bravo WS 720SC 1.5 pt	1,2,5-10				
	Switch 62.5WG 14.0 oz	4,5	545.5	j-l	0.268	e-l
26	Bravo WS 720SC 1.5 pt	1,2,5-10				
	Vangard 75WG 7.0 oz	4,5	508.3	a-k	0.299	i-p
27	Reason 500SC 6.9 fl oz + Dithane 75DF 2.0 lb + NIS 0.1% v/v	1,3				
	Serenade ASO 2.0 qt	2,4,6,8-10				
	Luna Tranquility 500SC 11.2 fl oz + Dithane 75DF 2.0 lb	5				
	Scala 606SC 7.0 fl oz + Dithane 75DF 2.0 lb	7	494.8	a-j	0.291	h-p
28	Reason 500SC 6.9 fl oz + Serenade ASO 2.0 qt + NIS 0.1% v/v	1,3				
	Echo Zn 4.17L 1.3 pt	2				
	Echo Zn 4.17L 2.12 pt	4,6,8-10				
	Luna Tranquility 500SC 11.2 fl oz + Serenade ASO 2.0 qt	5				
	Scala 606SC 7.0 fl oz + Serenade ASO	7	541.5	i-l	0.262	d-j
29	Reason 500 + NIS	1,3				
	Serenade ASO 2.0 qt	2				
	Luna Tranquility 500SC 11.2 fl oz + Serenade ASO 2.0 qt	4,6,8				
	Scala 606SC 7.0 fl oz + Serenade ASO 2.0 qt	5,7,9	532.0	g-l	0.226	a-e
30	Reason 500 + Dithane 75DF 2.0 lb	1,3				
	Echo Zn 4.17L 2.12 pt	2,4,6,8				
	Luna Tranquility 500SC 11.2 fl oz+Dithane 75DF 2.0 lb+NIS 0.1% v/v	5				
	Scala 606SC 7.0 fl oz + Dithane 75DF 2.0 lb	7				
	Dithane 75DF 2.0 lb + Super Tin 80WP 2.5 fl oz	9,10	568.3	l	0.226	a-e
31	Luna Tranquility 500SC 11.2 fl oz + NIS 0.1% v/v	1,2,5,6				
	Reason 500SC 5.5 fl oz + Echo Zn 4.17L 2.12 pt	3,7				
	Quash 50WDG 2.5 oz	4,8				
	Dithane 75DF 2.0 lb + Super Tin 80WP 2.5 fl oz	9,10	515.1	c-l	0.188	ab

32	Luna Tranquility 500SC 11.2 fl oz+ NIS 0.1% v/v	1-10	543.0	i-l	0.220	a-e
33	Luna Tranquility 500SC 11.0 fl oz	1,5				
	GWN-10126 SC 32.0 fl oz	2,3,6,7				
	Gavel 75DF 2.0 lb	4,8	534.5	f-l	0.230	b-g
34	Luna Tranquility 500SC 11.0 fl oz	1,5				
	GWN-10126 SC 32.0 fl oz	2,6				
	Gavel 75DF 2.0 lb	3,4,7,8	529.3	f-l	0.227	a-f
35	Luna Tranquility 500SC 11.0 fl oz	1,5				
	GWN-10126 SC 34.0 fl oz	2,3,6,7				
	Gavel 75DF 2.0 lb	4,8	511.3	b-k	0.210	a-c
36	Luna Tranquility 500SC 11.0 fl oz	1,5				
	GWN-10126 SC 34.0 fl oz	2,6				
	Gavel 75DF 2.0 lb	3,4,7,8	542.3	i-l	0.232	b-g
37	Experimental 1 100SE 14.5 fl oz	1-10	479.9	a-g	0.336	p-s
38	Experimental 1 100SE 28.9 fl oz	1-10	481.5	a-h	0.318	m-r
39	Experimental 1 100SE 43.4 fl oz	1-10	557.9	kl	0.284	h-o
40	Experimental 2 100SE 14.5 fl oz	1-10	481.9	a-h	0.322	m-r
41	Experimental 2 100SE 28.9 fl oz	1-10	505.0	a-k	0.320	m-r
42	Experimental 3 75EC 19.2 fl oz	1-10	455.1	a	0.321	m-r
43	Experimental 3 75EC 38.4 fl oz	1-10	522.7	d-l	0.258	c-j
44	Tanos 50DF 6.0 fl oz + Manzate 75WG 1.5 lb	1,3,5,7,9				
	Vertisan 1.67EC 1.0 pt + NIS 0.25% v/v	2,4,6,8,10	524.3	e-l	0.277	g-n

[x]Fungicide application dates: 1=1 Jul, 2 = 8 Jul, 3= 15 Jul, 4 = 22 Jul, 5 = 29 Jul, 6 = 5 Aug, 7 = 12 Aug, 8 = 19 Aug, 9 = 26 Aug, 10 = 2 Sep.
[y]Column numbers followed by the same letter are not significantly different at P=0.05 as determined by Fisher's Least Significant Difference (LSD) test.
[z]RAUDPC= Relative Area Under the Disease Progress Curve.

Economic evaluation of fungicide programs to control early blight of potato, 2015. John Hammel, Undergraduate Research Assistant, UW-Plant Pathology; S.A. Jordan, & A.J. Gevens, UW-Plant Pathology.

There are many fungicides registered for managing early blight of potato, with additional fungicides in development. However, the utility, implication, and cost of these fungicides must be considered in developing sound programs for economically and environmentally sustainable potato production. Using the data obtained from the 2015 Hancock field trial in combination with 2015 fungicide pricing data, as shown in table Table 1 (below), an economic analysis was conducted to evaluate the effect of each treatment on value per acre, as shown in Table 2 (below). If any component of the treatment was a product with no current retail price (i.e., if the product was experimental) or if no retail price could be obtained, the cost of chemicals was not calculated and such treatments were excluded from further evaluation. Retail price was not available for experimental products used in treatments 18-19 and 33-43, and could not be obtained for Moncoat MZ 7.5 DP used in treatment 4; therefore, the net value of yield per acre and the effect of treatment on value per acre were not calculated for these treatments.

Cost of chemicals per acre was calculated as the product of rate of application, number of applications, and retail cost of the component products used in the treatment. In the 2015 USDA report on potato economics, fresh market potatoes were valued at $10.00 per cwt (hundred weight or 100 pounds of potatoes), and processing potatoes were valued at $9.40 per cwt[14], and thus these market-specific values were used in calculating both fresh market and processing market values. These values aggregate and smooth variation in value resulting from one or more of following factors: ratio of tuber size profile, cull processing, specific gravity, percent bruise free, and presence of soft rot. Gross value of yield per acre was calculated as the product of marketable yield in cwt per acre and market-specific value per cwt for both markets. Net value of yield per acre was calculated by subtracting the cost of chemicals per acre from the gross market-specific value of yield per acre for both markets. Effect of treatment on value per acre was calculated by subtracting the net market-specific value of yield per acre of the untreated control treatment (treatment 1) from the net market-specific value of yield per acre of the treatment for both markets.

Results and Discussion: Of the 44 fungicide treatment programs tested, 14 treatments contained fungicides with no available and/or obtainable retail price, and thus the effect of these treatments on value per acre was not calculated. Of the remaining 29 treatments (withholding the untreated control), 26 provided positive effects on value per acre for both fresh market and processing crop values, with 3 providing negative effects (treatments 5-7). Compared to the untreated control, registered treatment effect on fresh market value ranged from a negative $568.00 (treatment 6) to a positive $963.12 (treatment 30) per acre. Compared to the untreated control, registered treatment effect on processing market value ranged from a negative $579.28 (treatment 6) to a positive $897.06 (treatment 30).

The success of the 26 value-creating treatments is partly associated with their relatively low chemical costs and/or the relatively high yield gains they provided as compared to the untreated control. The failure of the 3 value-destroying treatments is partly associated with their relatively high chemical costs and/or the relatively minimal yield gains they provided as compared to the untreated control. Variation among treatments may also be somewhat associated with slight differences in host-pathogen microenvironments.

Conclusion: Although early blight does not receive the same urgent attention as late blight, early blight remains a perennial economic concern to Wisconsin potato producers. Effective control of early blight through the application of foliar fungicides can provide economic benefits to Wisconsin potato producers in both the fresh market and processing market. While many fungicides are currently registered for managing early blight of potato in Wisconsin, and many more are currently being developed and/or going through the registration process, potato producers must carefully construct their fungicide regimes in order to maximize the potential quantity and quality of their yields. To develop such fungicide regimes, producers must strike a balance between the utility, implication, and cost of the fungicides in consideration. Failing to strike this balance leads to potential losses in yields, quality, and/or value per acre, and attests to the economic importance of field trials such as the one analyzed in this paper.

Ultimately, it remains the responsibility of the producer to ensure fungicides are applied according to their labels and that proper care is taken to limit fungicide resistance in pathogen populations. Wisconsin potato producers should consult their local Extension Service for information regarding fungicides currently registered for early blight management in their production region. Appropriately integrating effective, well-developed fungicide regimes with other early blight control practices helps protect producers' economic wellbeing, reduce environmental impacts, and support the long-term viability of Wisconsin's potato industry.

Table 1: Fungicide Product Pricing (2015)

Product	$/gallon	$/quart	$/pint	$/fluid ounce	$/pound	$/ounce
BacStop	255	63.75	31.875	1.992188		
Bravo WS 720SC	44.8	11.2	5.6	0.35		
Bravo Zn 4.17F	34.31	8.5775	4.28875	0.26804		
Champ WG					3.6	0.225
Cueva	54	13.5	6.75	0.421875		
Dithane 75DF					3	0.1875
Double Nickel LC	63.996	15.999	7.9995	0.499969		
Echo Zn 4.17L	24	6	3	0.1875		
EF400	245	61.25	30.625	1.914063		
Endura 70WG					68	4.25
Gavel 75DF					7.6	0.475
Inspire Super 2.82EW	222.45	55.6125	27.80625	1.737891		
Luna Tranquility 500SC	350	87.5	43.75	2.734375		
Manzate 75WG					3	0.1875
Moncoat MZ 7.5DP	-	-	-	-	-	-
NIS	14.95	3.7375	1.86875	0.116797		
Priaxor 4.17SC	505	126.25	63.125	3.945313		
Quadris 2.08SC	235	58.75	29.375	1.835938		
Quadris Top 2.71SC	303.66	75.915	37.9575	2.372344		
Quash 50WDG					104	6.5
Reason 500SC	315	78.75	39.375	2.460938		
Regalia	94	23.5	11.75	0.734375		
Revus Top	280	70	35	2.1875		
Scala 606SC	230.4	57.6	28.8	1.8		
Serenade ASO	29	7.25	3.625	0.226563		
Super Tin 80WP					18	1.125
Switch 62.5WG					83.2	5.2
Tanos 50DF					38	2.375
Vanguard 75WG					63.2	3.95
Vertisan 1.67EC	172	43	21.5	1.34375		

Table 2. Effect of treatment on value per acre.

Trt. No.	Cost of chemicals ($/A)	Marketable yield (cwt/A)	Gross value of yield ($/A)		Net value of yield ($/A)		Effect of treatment on value ($/A)	
			Fresh Market	Processing	Fresh Market	Processing	Fresh Market	Processing
1	0 (Untreated control)	458.2	4582.00	4307.08	4582.00	4307.08	0	0
2	39.70	463.9	4639.00	4360.66	4599.30	4320.96	17.30	13.88
3	173.47	487.7	4877.00	4584.38	4703.53	4410.91	121.53	103.83
4	-	468.0	4680.00	4399.20	-	-	-	-
5	144.00	468.3	4683.00	4402.02	4539.00	4258.02	-43.00	-49.06
6	756.00	477.0	4770.00	4483.80	4014.00	3727.80	-568.00	-579.28
7	359.98	475.1	4751.00	4465.94	4391.02	4105.96	-190.98	-201.12
8	60.00	508.4	5084.00	4778.96	5024.00	4718.96	442.00	411.88
9	90.92	519.4	5194.00	4882.36	5103.08	4791.44	521.08	484.36
10	96.69	523.1	5231.00	4917.14	5134.31	4820.45	552.31	513.37
11	72.00	529.6	5296.00	4978.24	5224.00	4906.24	642.00	599.16
12	155.62	528.2	5282.00	4965.08	5126.38	4809.46	544.28	502.38
13	152.61	539.9	5399.00	5075.06	5246.39	4922.45	664.39	615.37
14	93.12	549.2	5492.00	5162.48	5398.88	5069.36	816.88	762.28
15	158.37	539.6	5396.00	5072.24	5237.63	4913.87	655.63	606.79
16	153.00	530.7	5307.00	4988.58	5154.00	4835.58	572.00	528.50
17	463.70	526.9	5269.00	4952.86	4805.30	4489.16	223.30	182.08
18	-	553.8	5538.00	5205.72	-	-	-	-
19	-	522.5	5225.00	4911.50	-	-	-	-
20	306.25	537.3	5373.00	5050.62	5066.75	4744.37	484.75	437.29
21	191.25	547.9	5479.00	5150.26	5287.75	4959.01	705.75	651.93
22	260.96	538.8	5388.00	5064.72	5127.04	4803.76	545.04	496.68
23	114.65	521.3	5213.00	4900.22	5098.35	4785.57	516.35	478.49
24	136.72	541.0	5410.00	5085.40	5273.28	4948.68	691.28	641.60
25	212.80	545.5	5455.00	5127.70	5242.20	4914.90	660.20	607.82
26	122.50	508.3	5083.00	4778.02	4960.50	4655.52	378.50	348.44
27	189.23	494.8	4948.00	4651.12	4758.77	4461.89	176.77	154.81

28	171.93	541.5	5415.00	5090.10	5243.07	4918.17	661.07	611.09
29	259.29	532.0	5320.00	5000.80	5060.71	4741.51	478.71	434.43
30	137.88	568.3	5683.00	5342.00	5545.12	5204.14	963.12	897.06
31	214.51	515.1	5151.00	4841.94	4936.49	4627.43	354.49	320.35
32	311.48	543.0	5430.00	5104.20	5118.52	4792.72	536.52	485.64
33	-	534.5	5345.00	5024.30	-	-	-	-
34	-	529.3	5293.00	4975.42	-	-	-	-
35	-	511.3	5113.00	4806.22	-	-	-	-
36	-	542.3	5423.00	5097.62	-	-	-	-
37	-	479.9	4799.00	4511.06	-	-	-	-
38	-	481.5	4815.00	4526.10	-	-	-	-
39	-	557.9	5579.00	5244.26	-	-	-	-
40	-	481.9	4819.00	4529.86	-	-	-	-
41	-	505.0	5050.00	4747.00	-	-	-	-
42	-	455.1	4551.00	4277.94	-	-	-	-
43	-	522.7	5227.00	4913.38	-	-	-	-
44	207.79	524.3	5243.00	4928.42	5035.21	4720.63	453.21	413.55