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PROJECT TITLE: The effect of row spacing, planting rate and Cerone on three spring malting barley varieties grown under irrigation management. 1991.

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PROJECT LOCATION: MSU-Southern Agricultural Research Center
Huntley, MT 59037

OBJECTIVES: To evaluate malting barley yield and quality as affected by planting rate, row width, and use of a plant growth regulator (Cerone). Each barley variety was seeded to 50, 100, and 150 lb/A on 4, 6, or 12 inch row spacing to evaluate effect on yield, test weight, plumpness, and lodging of, Moravian III, Clark, and Klages barleys.

RESULTS: The results with regard to Cerone applications in 1991 are similar to 1990, but in sharp contrast to previous years. Cerone applications did not affect yield, and actually improved plumpness, and reduced lodging. While in previous years when the crops were stressed, Cerone significantly lowered barley yields. The yield and agronomic data for the three barley varieties, Clark, Klages, and Moravian III with or without Cerone applications are given in Tables 1-6. Seeding rate of Clark barley showed a tendency to result in slightly lower percent plump at the higher seeding rates, along with increased lodging, fewer spikes/meter, and a decrease in seeds/head. Heading date was delayed by the 50 lb/A rate (Table 1,2). The Klages variety responded similarly to Clark (Tables 3,4). Results showed that seeding rate reduced yield, height, plumpness, and increased lodging. As in the case of Clark, heading date was also delayed at the 50 lb/A rate. The Moravian II data followed the same trend (Tables 5,6). The only real change was that test weight was not affected by seeding rate.

Tables 7, and 8 summarize the 1991 data. Seeding rate overall had an effect on all characteristics except yield, while row spacing affected yield, test weight, spikes/meter, and heading date. Cerone overall reduced plant height, and lodging, while increasing plumpness, decreasing percent thins, increased spikes/meter.

SUMMARY: Generally the results indicate that over the past several years, which included years of severe stress, there was no clear trends for any effects of either seeding rate or row spacing on yield and quality of the barley varieties used in this study. In 1991 the Cerone treatment did shorten plant height, reduced lodging, and increased plumpness while not lowering yields.

These results again support the fact that Cerone is a valuable tool to prevent lodging in barley, however if stress conditions exist, such as moisture, extreme heat, or hail after application, the Cerone will reduce barley yields. If these stresses do not exist the application of Cerone can enhance the harvestability and quality yield of barley.

FUTURE PLANS: With two years without stress, and two with stress, we should be able to totally summarize the data, and publish the results.

TABLE 1. 1991 IRRIGATED SPRING BARLEY MANAGEMENT TRIAL CEROKE APPLIED ON 3 VARIETIES BARLEY,
AT 3 SEEDING RATES AND 3 ROW SPACINGS SARC, HUNTLKY, MT.

CLARK BARLEY UNTREATED.

MANAGEMENT	YIELD	TEST	JULIAN	PLANT	KERNALS	SPIKES	%	%	LODGING		
LBS/ACRE	BU/AC	WEIGHT	HEAD	HEIGHT	PER	PER	PLUMP	THIN	PREVAL	SEVER	INDEX
ROW SPACING		LB/BU	DATE	INCHES	SPIKE	METER					
50 AT 4	101.9 AB	50.8 BC	169.8 E	34.8 A	24.3 D	103.2 A	93.1 C	2.5 A	0.0 A	0.0 A	0.0 A
50 AT 6	104.2 BC	50.9 BC	168.6 D	35.4 AB	25.5 E	125.2 ABC	93.6 C	3.1 AB	1.0 AB	18.0 B	5.3 AB
50 AT 12	95.0 A	50.2 ABC	168.2 CD	36.6 ABC	24.0 CD	146.2 CD	90.8 ABC	4.7 ABCD	0.0 A	0.0 A	0.0 A
100 AT 4	123.1 E	49.9 AB	168.0 CD	35.6 AB	23.0 BC	101.0 A	91.8 BC	3.7 ABC	2.8 CD	40.0 C	20.4 C
100 AT 6	118.9 DE	49.5 A	167.6 ABC	37.8 C	22.1 AB	134.2 BC	89.1 AB	5.9 CD	1.6 BC	20.0 B	8.4 ABC
100 AT 12	111.3 CD	51.0 BC	167.0 AB	36.8 BC	22.4 AB	171.0 E	92.9 C	3.6 ABC	0.0 A	0.0 A	0.0 A
150 AT 4	124.8 E	49.8 AB	167.0 AB	37.8 C	22.4 AB	115.8 AB	87.9 A	6.9 D	3.2 D	24.0 BC	14.7 BC
150 AT 6	118.6 DE	51.2 C	167.8 BCD	38.0 C	21.5 A	108.8 A	90.6 ABC	5.0 BCD	3.4 D	28.0 BC	18.7 C
150 AT 12	113.8 D	50.3 ABC	166.8 A	35.8 AB	22.2 AB	159.2 DE	89.2 AB	5.7 CD	2.2 BCD	24.0 BC	17.8 C
SUMMARY STATISTICS:											
P-VALUE =	.0001	.4899	.0026	.1625	.0001	.0010	.1895	.1676	.0064	.0139	.0696
LSD(0.05 byt)	12.28	1.76	1.40	2.70	1.59	34.92	4.67	3.35	2.23	24.33	17.38

Numbers within columns with the same letter(s) are not significantly different at the 5% level.

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TABLE 2. 1991 IRRIGATED SPRING BARLEY MANAGEMENT TRIAL CERONE APPLIED ON 3 VARIETIES BARLEY,
AT 3 SEEDING RATES AND 3 ROW SPACINGS SARC, HUNTLEY, MT.

CLARK BARLEY WITH CERONE APPLIED.

MANAGEMENT	YIELD	TEST	JULIAN	PLANT	KERNALS	SPIKES	%	%	LODGING		
LBS/ACRE	BU/AC	WEIGHT	HEAD	HEIGHT	PER	PER	PLUMP	THIN	PREVAL	SEVER	INDEX
ROW SPACING		LB/BU	DATE	INCHES	SPIKE	METER					
50 AT 4	100.4 A	50.5 AB	169.4 D	34.0 A	23.9 D	93.2 A	93.0 BC	2.8 AB	0.0 A	0.0 A	0.0 A
50 AT 6	102.7 AB	49.7 A	168.8 CD	35.0 A	23.4 CD	119.6 BC	92.6 BC	3.3 ABC	0.6 AB	18.0 AB	6.0 A
50 AT 12	97.2 A	51.2 B	168.6 C	35.0 A	24.2 D	164.2 DE	94.0 C	2.4 A	1.0 AB	12.0 AB	6.7 A
100 AT 4	121.7 D	50.2 AB	168.6 C	34.4 A	22.0 AB	115.6 ABC	91.1 AB	4.7 BCDE	0.0 A	0.0 A	0.0 A
100 AT 6	122.8 D	50.3 AB	167.8 B	35.4 A	21.8 A	129.0 C	90.5 AB	5.0 CDE	0.6 AB	16.0 AB	5.3 A
100 AT 12	110.7 BC	51.2 B	167.0 A	34.8 A	22.9 BC	185.2 EF	92.2 BC	3.8 ABCD	0.0 A	00.0 A	0.0 A
150 AT 4	114.3 CD	49.6 A	167.4 AB	35.6 A	22.1 AB	98.0 AB	89.3 A	5.9 E	3.8 D	38.0 C	30.4 C
150 AT 6	118.7 CD	50.0 A	167.8 B	35.2 A	21.4 A	154.0 D	90.4 AB	4.9 CDE	2.8 CD	28.0 BC	21.8 BC
150 AT 12	111.5 BC	50.7 AB	167.0 A	34.2 A	21.9 A	194.0 F	90.7 AB	5.3 DE	2.0 BC	18.0 AB	10.0 AB
SUMMARY STATISTICS:											
P-VALUE =	.0007	.3431	.0000	.9291	.0005	.0000	.3164	.1579	.0102	.0667	.0167
LSD(0.05 byt)	12.60	1.55	0.92	2.50	1.32	32.81	3.93	2.77	2.28	26.65	18.36

Numbers within columns with the same letter(s) are not significantly different at the 5% level.

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TABLE 3. 1991 IRRIGATED SPRING BARLEY MANAGEMENT TRIAL CERONE APPLIED ON 3 VARIETIES BARLEY,
AT 3 SEEDING RATES AND 3 ROW SPACINGS SARC, HUNTLEY, MT.

KLAGES BARLEY UNTREATED.

MANAGEMENT	YIELD	TEST	JULIAN	PLANT	KERNALS	SPIKES	%	%	LODGING		
LBS/ACRE	BU/AC	WEIGHT	HEAD	HEIGHT	PER	PER	PLUMP	THIN	PREVAL	SEVER	INDEX
ROW SPACING		LB/BU	DATE	INCHES	SPIKE	METER					
50 AT 4	115.4 DE	49.6 D	170.4 D	37.0 CDE	23.4 BC	110.8 A	84.1 D	7.9 A	2.8 AB	28.0 A	17.1 A
50 AT 6	114.7 CDE	49.6 D	170.4 D	37.2 CDE	24.0 C	104.8 A	86.2 D	6.9 A	1.8 A	32.0 A	16.0 A
50 AT 12	116.5 E	49.7 D	169.4 C	37.4 E	23.0 BC	161.4 B	85.8 D	6.7 A	1.8 A	24.0 A	12.0 A
100 AT 4	102.8 AB	48.9 CD	168.8 ABC	35.4 BCD	22.3 AB	125.0 A	78.1 C	11.9 B	5.6 D	58.0 B	43.8 B
100 AT 6	109.8 BCDE	48.4 CD	169.4 C	36.8 CDE	23.8 C	126.2 A	77.2 C	12.1 B	5.0 CD	63.8 B	45.6 B
100 AT 12	107.1 BCD	47.7 BC	168.4 AB	35.2 BC	23.3 BC	187.6 B	77.1 C	12.5 B	4.0 BC	54.0 B	32.9 B
150 AT 4	96.6 A	45.7 A	169.0 BC	32.8 A	21.6 A	126.2 B	68.6 A	17.8 D	7.8 E	83.8 C	72.7 C
150 AT 6	96.9 A	46.6 AB	168.6 AB	33.2 A	22.2 AB	126.6 A	70.3 AB	16.5 CD	7.4 E	89.8 C	74.9 C
150 AT 12	106.4 BC	46.7 AB	168.2 A	33.8 AB	21.8 A	177.0 B	72.8 B	15.3 C	7.4 E	85.8 C	72.5 C
SUMMARY STATISTICS:											
P-VALUE =	.0070	.0012	.0004	.0023	.0464	.0011	.0000	.0000	.0000	.0000	.0000
LSD(0.05 byt)	12.15	2.11	1.05	2.66	1.66	41.14	5.55	3.45	2.24	27.4	20.3

Numbers within columns with the same letter(s) are not significantly different at the 5% level.

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TABLE 4. 1991 IRRIGATED SPRING BARLEY MANAGEMENT TRIAL CERONE APPLIED ON 3 VARIETIES BARLEY,
AT 3 SEEDING RATES AND 3 ROW SPACINGS SARC, HUFFLEY, MT.

KLAGES BARLEY WITH CERONE APPLIED.

MANAGEMENT	YIELD	TEST	JULIAN	PLANT	KERNALS	SPIKES	%	%	LODGING		
LBS/ACRE	BU/AC	WEIGHT	HEAD	HEIGHT	PER	PER	PLUMP	THIN	PREVAL	SEVER	INDEX
ROW SPACING		LB/BU	DATE	INCHES	SPIKE	METER					
50 AT 4	115.9 BC	49.0 BC	170.4 E	36.4 DE	23.1 BCD	114.8 A	86.1 C	7.0 A	1.2 AB	12.0 A	8.0 AB
50 AT 6	119.1 C	48.7 BC	170.6 E	36.8 E	23.1 BCD	137.2 AB	85.9 C	7.5 A	1.8 BC	12.0 A	6.0 A
50 AT 12	115.1 BC	49.4 C	169.6 D	36.2 DE	23.9 D	192.2 D	86.7 C	6.9 A	0.0 A	0.0 A	0.0 A
100 AT 4	111.1 B	47.9 BC	169.2 CD	36.2 DE	21.8 A	116.6 A	80.1 B	11.3 BC	3.4 C	34.0 B	32.2 CD
100 AT 6	113.9 BC	48.8 BC	170.4 E	34.2 BC	23.4 CD	119.4 A	80.8 B	10.9 BC	3.4 C	36.0 BC	34.0 CDE
100 AT 12	109.3 B	48.9 BC	168.6 B	35.4 CD	23.0 BCD	185.0 CD	82.2 BC	9.8 AB	2.8 BC	32.0 B	24.9 BC
150 AT 4	113.9 BC	46.1 A	168.8 BC	32.4 A	22.3 AB	129.0 AB	74.1 A	15.1 D	7.2 E	83.8 D	69.6 F
150 AT 6	113.7 BC	47.7 B	169.0 BC	33.8 B	23.3 BCD	153.4 B	77.6 AB	12.5 BCD	5.4 D	79.8 D	51.8 EF
150 AT 12	99.5 A	48.3 BC	167.8 A	35.8 DE	22.5 ABC	159.6 BC	73.8 A	12.9 CD	5.2 D	54.0 C	44.7 DE
SUMMARY STATISTICS:											
P-VALUE =	.0248	.1507	.0000	.0004	.2370	.0035	.0010	.0017	.0000	.0000	.0000
LSD(0.05 byt)	10.03	2.20	0.67	1.91	1.57	44.4	6.90	4.15	2.48	27.47	26.18

Numbers within columns with the same letter(s) are not significantly different at the 5% level.

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TABLE 5. 1991 IRRIGATED SPRING BARLEY MANAGEMENT TRIAL CEROSE APPLIED ON 3 VARIETIES BARLEY, AT 3 SEEDING RATES AND 3 ROW SPACINGS SARC, HUNTLEY, MT.

MORAVIAN III BARLEY UNTREATED.

MANAGEMENT	YIELD	TEST	JULIAN	PLANT	KERNALS	SPIKES	%	%	LODGING		
LBS/ACRE	BU/AC	WEIGHT	HEAD	HEIGHT	PER	PER	PLUMP	THIN	PREVAL	SEVER	INDEX
ROW SPACING		LB/BU	DATE	INCHES	SPIKE	METER					
50 AT 4	118.1 D	50.6 AB	168.6 E	33.8 AB	24.3 D	92.8 A	91.1 CD	4.9 AB	.80 A	16.0 AB	7.1 A
50 AT 6	116.9 CD	51.0 AB	168.2 DE	36.2 CD	23.4 CD	125.2 B	91.9 D	4.4 A	1.8 A	10.0 A	10.0 AB
50 AT 12	115.9 BCD	51.5 B	167.4 BC	37.0 D	23.6 CD	173.2 C	91.4 CD	4.8 AB	0.0 A	0.00 A	0.0 A
100 AT 4	114.6 BCD	50.6 AB	167.8 CD	36.2 CD	22.0 AB	113.8 AB	89.0 BC	5.4 ABC	3.8 B	36.0 BC	27.1 BC
100 AT 6	108.4 AB	51.1 AB	167.4 BC	36.4 D	22.9 BC	107.2 AB	89.1 BCD	5.6 ABC	4.2 B	40.0 C	32.9 C
100 AT 12	109.1 ABC	50.2 A	167.4 BC	36.2 CD	22.8 ABC	172.2 C	87.9 B	6.6 CD	4.2 B	34.0 BC	29.6 C
150 AT 4	108.0 AB	50.4 AB	166.8 AB	32.8 A	21.7 A	125.0 B	86.8 AB	6.5 BCD	6.2 C	64.0 D	56.7 D
150 AT 6	109.7 ABC	50.2 AB	167.0 AB	36.0 CD	22.2 AB	116.0 AB	87.9 B	6.4 BC	6.2 C	62.0 D	55.3 D
150 AT 12	103.4 A	50.1 A	166.6 A	34.9 BC	22.2 AB	194.7 C	84.9 A	8.1 D	5.2 BC	46.0 CD	44.2 CD
SUMMARY STATISTICS:											
P-VALUE =	.1618	.7982	.0006	.0021	.0307	.0001	.0214	.0689	.0002	.0006	.0004
LSD(0.05 byt)	11.3	1.71	.87	1.98	1.55	39.98	4.01	2.27	2.80	29.74	26.75

Numbers within columns with the same letter(s) are not significantly different at the 5% level.

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TABLE 6. 1991 IRRIGATED SPRING BARLEY MANAGEMENT TRIAL CERONE APPLIED ON 3 VARIETIES BARLEY,
AT 3 SEEDING RATES AND 3 ROW SPACINGS SARC, HUNFLEY, MT.

MORAVIAN III BARLEY WITH CERONE APPLIED.

MANAGEMENT	YIELD	TEST	JULIAN	PLANT	KERNALS	SPIKES	%	%	LODGING		
LBS/ACRE	BU/AC	WEIGHT	HEAD	HEIGHT	PER	PER	PLUMP	THIN	PREVAL	SEVER	INDEX
ROW SPACING		LB/BU	DATE	INCHES	SPIKE	METER					
50 AT 4	101.6 A	50.9 ABCD	168.6 CD	34.6 ABC	23.5 C	118.6 AB	90.6 BC	5.3 ABC	1.8 AB	8.0 AB	8.0 AB
50 AT 6	118.2 C	51.0 BCD	169.0 D	34.2 AB	22.6 BC	127.0 AB	91.8 C	4.7 AB	0.0 A	0.0 A	0.0 A
50 AT 12	111.8 BC	51.7 D	168.1 BC	36.7 C	28.2 C	196.8 D	92.5 C	4.1 A	0.0 A	0.0 A	0.0 A
100 AT 4	113.1 BC	49.9 A	168.0 BC	34.6 ABC	22.9 BC	99.6 A	88.3 AB	6.1 ABC	3.0 BC	22.0 BC	19.1 BCD
100 AT 6	115.9 BC	50.4 ABC	167.6 B	36.0 BC	20.0 A	129.6 AB	89.1 ABC	5.5 ABC	2.2 ABC	24.0 BC	14.7 ABC
100 AT 12	107.2 AB	51.3 CD	167.6 B	34.2 AB	22.2 A	179.4 CD	87.8 AB	6.4 BC	2.8 BC	26.0 BC	20.4 BCD
150 AT 4	112.7 BC	50.2 AB	168.0 BC	33.2 A	22.0 BC	109.4 A	88.2 AB	5.7 ABC	4.0 BC	34.0 C	25.8 BCD
150 AT 6	114.4 BC	50.1 AB	167.4 AB	33.6 A	22.5 BC	148.4 BC	88.0 AB	6.4 BC	4.6 C	42.0 C	34.9 D
150 AT 12	101.3 A	50.8 ABCD	166.8 A	34.1 AB	21.1 B	186.5 D	86.6 A	6.9 C	3.6 BC	32.0 C	32.0 CD

SUMMARY STATISTICS:

P-VALUE =	.1394	.2639	.0048	.5311	.1902	.0003	.2036	.6592	.1086	.0737	.0747
LSD(0.05 byt)	13.48	1.42	1.01	3.22	2.50	44.2	4.56	2.86	3.51	30.8	26.1

Numbers within columns with the same letter(s) are not significantly different at the 5% level.

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TABLE 7. 1991 IRRIGATED SPRING BARLEY MANAGEMENT TRIAL CERONE APPLIED ON 3 VARIETIES BARLEY,
AT 3 SEEDING RATES AND 3 ROW SPACINGS SARC, HUNTLEY, MT.

VARIABLE	YIELD bu/ac	TEST WEIGHT lb/bu	1000 KERNAL WEIGHT	PERCENT PLUMP	PERCENT THIN	PLANT COUNT/ METER	SEEDS/ HEAD	HEADING DATE Julian	PLANT HEIGHT inches	LODGING		
										prev	sever	index
<u>VARIETY:</u>												
CLARK	111.8 A	50.4 B	- - -	91.3 C	4.4 A	134.3 A	22.8 A	168.0 A	35.7 A	1.4 A	15.8 A	9.2 A
KLAGES	109.9 A	48.2 A	- - -	79.3 A	11.2 C	141.8 A	22.9 B	169.3 B	35.3 A	4.1 C	47.9 C	36.6 C
MORAVIAN III	111.0 A	50.6 B	- - -	89.0 B	5.8 B	139.9 A	22.5 A	167.7 A	35.0 A	3.0 B	27.6 B	23.2 B
<u>TREATMENT:</u>												
CERONE	111.4 A	49.8 A	- - -	87.2 B	6.8 A	142.6 B	22.6 A	168.4 B	34.9 A	2.3 A	24.5 A	18.8 A
CHECK	110.4 A	49.7 A	- - -	85.9 A	7.5 B	134.7 A	22.9 A	168.2 A	35.8 B	3.3 B	36.3 B	27.2 B
<u>SEEDING RATE:</u>												
150 lb/A	110.0 A	49.1 A	- - -	83.1 A	9.2 C	143.5 B	22.0 A	167.6 A	34.6 A	4.9 C	50.9 C	41.6 C
100 lb/A	112.8 A	49.8 B	- - -	86.3 B	7.3 B	138.8 AB	22.5 B	168.1 B	35.6 B	2.7 B	29.8 B	21.7 B
50 lb/A	109.8 A	50.4 C	- - -	90.1 C	5.0 A	133.7 A	23.7 C	169.1 C	35.7 B	0.9 A	10.6 A	5.7 A
<u>ROW SPACING:</u>												
12 inch	107.8 A	50.0 B	- - -	86.6 A	7.1 A	177.1 C	22.8 A	167.8 A	35.5 A	2.3 A	24.5 A	19.3 A
6 inch	113.2 B	49.7 AB	- - -	86.8 A	7.0 A	127.3 B	22.7 A	168.5 B	35.6 A	3.0 A	34.4 B	24.5 A
4 inch	111.7 B	49.5 A	- - -	86.2 A	7.3 A	111.6 A	22.7 A	168.6 B	34.9 A	3.2 A	32.3 AB	25.2 A

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ANALYSIS OF VARIANCE

TABLE 8. 1991 IRRIGATED SPRING BARLEY MANAGEMENT TRIAL CKRORE APPLIED ON 3 VARIETIES BARLEY, AT 3 SEEDING RATES AND 3 ROW SPACINGS SARC, HUNTLEY, MT.

SOURCE	df	YIELD	TEST	1000	PERCENT	PERCENT	PLANT	SEEDS/	HEADING	PLANT	LODGING		
		bu/ac	WEIGHT lb/bu	KERNAL WEIGHT	PLUMP	THIN	COUNT/ METER	HEAD	DATE Julian	HEIGHT inches	% prev	sever	index
REPLICATION	4	----	----	----	----	----	----	----	----	----	----	----	----
ETHEPHONE TMT	1	----	----	----	*	*	*	----	*	**	*	**	**
SEEDING RATE	2	----	**	----	**	**	----	**	**	*	**	**	**
TMT X SEED RATE	2	----	----	----	----	----	----	----	----	----	----	----	----
ROW SPACING	2	**	**	----	----	----	**	----	**	*	----	----	----
TMT X ROW SP	2	----	----	----	----	----	----	----	----	----	----	----	----
SEED RT X ROW SP	4	----	----	----	----	----	----	----	----	----	----	----	----
TMT X RT X SP	4	----	----	----	----	----	----	----	----	----	----	----	----
VARIETY	2	----	**	----	**	**	----	----	**	----	**	**	**
TMT X VAR	2	----	----	----	----	----	----	----	----	----	----	----	----
RATE X VAR	4	**	**	----	**	**	----	----	----	**	----	**	**
TMT X RT X VAR	4	----	----	----	----	----	----	----	----	----	----	----	----
SP X VAR	4	----	----	----	----	----	----	----	----	----	----	----	----
TMT X SP X VAR	4	----	----	----	----	----	----	----	----	----	----	----	----
RT X SP X VAR	8	----	----	----	----	----	----	----	----	----	----	----	----
TMT X RT X SP X VAR	8	----	----	----	----	----	----	----	----	----	----	----	----
RESIDUAL	212	----	----	----	----	----	----	----	----	----	----	----	----

*, ** SIGNIFICANCE AT 0.05 AND 0.01 PROBABILITY LEVELS, RESPECTIVELY.

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