2002 Sugarbeet Research and Extension Reports. Volume 33, Page 235-240

INTEGRATED MANAGEMENT OF CERCOSPORA LEAF SPOT

Barry J. Jacobsen[1], B. Larson[1], N. K. Zidack[1], J. Ansley[1], J.L.A. Eckhoff[2] and J. Bergman[2]
1. Department of Plant Sciences and Plant Pathology, Montana State University-Bozeman. 2. Montana Agricultural Experiment Station-Eastern Agricultural Research Center, Sidney, MT.

Management of Cercospora leaf spot (CLS) is critical to both growers and processors because this disease reduces harvestable tons, sugar content, storability of harvested roots and decreases sugar extraction/ton in the extraction process through increased impurities and loss to molasses. In Montana and western North Dakota losses over the past 6 years have ranged from 1-3 tons/A and 0.5-1.5% sugar. Fungicide sprays have increased net income by $0-350/A. Storage and factory losses have been more difficult to measure but are probably near equal to field losses if this disease is not controlled. Economically sound management of Cercospora leaf spot requires an integrated approach that incorporates crop rotation, planting varieties with at least an intermediate level of resistance, use of environmental monitoring to predict infection conditions, scouting and timely application of effective fungicides. Over the past 4 years we have demonstrated that varieties with intermediate levels of resistance are equal in yield potential and will produce equal yields with lower fungicide inputs.

Crop rotation and other practices which hasten decay of infected leaves will reduce initial inoculum and initial infection. Disease development each year is dependent on inoculum that survives the winter in infected leaves and petioles of the previous year sugarbeet crop or weeds such as winged pigweed, lambsquater, pigweed, mallow, wild buckwheat and common unicorn flower. The *Cercospora beticola* fungus dies out rapidly once the leaves begin to decay, therefore tillage or other practices that hasten decay will reduce potential for overwintering inoculum. In the spring and early summer when temperatures exceed 60-65^0 F and the overwintering leaves are wet for long period of time (4-24 hours depending on temperature) spores (conidia) are produced from fungal stroma in overwintered leaves and petioles. These spores are spread by wind or splashing water generally less than 100-150 yards. In the narrow river valleys of Montana it can be difficult to separate current year planting sufficiently from previous years crop residues to take advantage of this limited spread potential, therefore destruction of beet foliage residues is very critical.

Historically, sugarbeets with high levels of resistance to CLS (low KWS scores) have produced lower economic returns (reduced tons and sugar content) than susceptible varieties when produced under an appropriate fungicide spray program. However, the use of moderately resistant varieties (KWS 4.3-5.5) is now widely accepted in most production areas because varieties with this level of resistance are competitive with susceptible varieties sprayed with fungicides. The full potential of these varieties to reduce fungicide use has not been fully exploited since almost all research has been done with fungicide programs starting at disease onset and being repeated at 14 day intervals till15-30 days before harvest. For the past four years we have studied the integration of moderately resistant varieties with reduced fungicide application. In 1999 and 2000 studies under light disease pressure our data has shown that varieties with KWS scores of 4.3 and 5.3 achieved equal yield and disease control with 1-2 fewer sprays than a susceptible variety with a KWS score of 6.3. In these years the Minnesota prediction model would have indicated the need for 2-3 sprays. In 2001 and 2002 we studied these same varieties and disease pressure was moderately severe with the Minnesota prediction model indicating the need for 4 applications. Data averaging the 2001 and 2002 trials are presented in Table 1.

In the years 1999-2002, three varieties Beta 2185 (KWS=6.3), HH 111(KWS =5.3) and HM 7054 (KWS=4.3) were selected based on differences in their KWS scores and were examined for their response to varying numbers of fungicide applications and application based on the Minnesota predictive model. In 1999 and 2000, the Minnesota predictive model indicated that 2-3 fungicide sprays should be applied while in both 2001 and 2002, this model indicated a need for 4 fungicide applications. The 2002 season allowed for infections through the first 2 weeks of September whereas in the other years basically no September infections occurred because of cool night temperatures. Disease severity as measured by area under the disease progress curve was 15.9 in 1999, 13.0 in 2000, 58.3 in 2001and 53.1 in 2002 for the susceptible variety Beta 2185. When 2001and 2002 data were analyzed across varieties there were no differences in % sucrose by treatment. In 2001there were significant differences in ton/A and sucrose yield but not in 2002. The area under the disease progress curve (AUDPC) was significantly different for the 3 varieties and with treatment (Table 1.). To achieve optimal disease control and yield on the susceptible variety Beta 2185 (KWS=6.3) required 4 sprays, on the moderately susceptible HH111 (KWS=5.3) AUDPC required 4 sprays but yield was maximized with 2-3 sprays and on the highly resistant HM 7054 only two sprays were required to achieve optimal disease control as measured by AUDPC and yield was statistically unchanged by all fungicide programs.(Table 1.). With no fungicide application the moderately susceptible HH 111 and the resistant HM 7054 had lower AUDPC than the susceptible variety Beta 2185 but these differences equalized with optimal fungicide programs.

Infection conditions as indicated by the Minnesota predictive model indicated that 4 applications were needed. This proved true for the susceptible Beta 2185 but not for the more resistant HH 111 and HM 7024 where 1-2 sprays could be saved and still achieve acceptable disease control and economic yield. The biological control treatment BAC J was more effective on the more resistant varieties than on the susceptible Beta 2185 as measured by AUDPC but not necessarily for yield. Thus, the choice of a moderately resistant or resistant variety with reduced fungicide application would be more profitable than the susceptible variety with more fungicide applications and the integration of the biological Bac J is more successful on varieties with some resistance. The integration of the half rate of Eminent with Bac J provided yield statistically equal to four applications of fungicide

Table 1. Integration of variety resistance to Cercospora leaf spot, fungicides, fungicide application number and the biological control Bac J for Management of Cercospora leaf spot of sugarbeet data summarized for 2001and 2002

Treatment	**Beta 2185 KWS = 6.3**		**HH 111 KWS = 5.3**		**HM 7054 KWS =4.3**	
	AUDPC (2)	**Sugar lbs per A**	**AUDPC**	**Sugar lbs. per A**	**AUDPC**	**Sugar lbs. per A**
unsprayed	55.7	8026	55.1	8182	34.7	8555
4 sprays (1)	19.3	8875	15.4	9079	11.9	9100
3 sprays	22.8	8469	21.5	9002	11.4	8746
2 sprays	22.3	8478	28.0	8902	15.7	8666
Bac J preventive + 14, 28 and 42 days	46.7	9061	37.4	8682	21.2	8777
Eminent 6.5 oz/A + Bac J onset + Bac J 14, 28, and 42 days	25.3	8979	31.1	8875	18.2	8501
Flsd 0.05	4.15	588	4.15	588	4.15	588

(1) Mean of spray at disease onset plus 14. 28 and 42 days and Minnesota predictive model since they were the same. First spray at disease onset 2001 =Eminent @ 13 oz./A, second spray=Benlate @ 0.5lb/A, third and fourth spray =SuperTin @ 5.0 oz/A, 2002 first spray = Eminent @ 13 oz./A, second spray= Gem 7.0 oz/A, third spray=SuperTin 5.0 oz/A, fourth spray=Headline 9.2 oz/A
(2) AUDPC = Area under the disease progress curve.

In 2002, this experiment was expanded by addition of 3 new varieties with moderate levels of resistance. Six varieties Beta 2185 (KWS 6.3), HH 111(KWS 5.3), Monarch / HH 115 (KWS 5.0), Beta 3820 (KWS 4.4) and HM 7054 (KWS 4.2) were selected based on their approved basis, past use and differences in their KWS scores were examined for their response to varying numbers of fungicide applications and application based on the Minnesota predictive model. Plots were planted May 3 and all plots were thinned to 46 plants per 30ft plot. In 2002, this model suggested the need for 4 applications based on infection conditions and the effective life of the fungicide used. Warm weather allowed nearly continuous infection through mid-September. Fungicide applications were initiated on July 2 and applied at 14 day intervals for up to a total of 4 applications.

When varieties were analyzed across all fungicide treatments there were no differences in tons/A, % sucrose, or extractable sucrose but there were differences in Area Under the Disease Progress Curve (AUDPC) (Table 1.) Beta 3820 and HM 7054 (varieties with the lowest KWS scores) had the lowest AUDPC (Table 1.)

Table 1. Variety effect only across all fungicide treatments

Variety (KWS)	Tons/A	% Sugar	Extract Sugar lbs/A	AUDPC
2185 (6.3)	25.74 A	17.47 A	9004.8 A	24.83 B
HH 111 (5.3)	25.57 A	17.71 A	9051.8 A	33.61 A
HH 115 (5.0)	25.49 A	17.63 A	8989.0 A	28.19 B
Monarch (5.0)	25.68 A	17.62 A	9048.5 A	27.40 B
B 3820 (4.4)	25.97 A	17.55 A	9114.2 A	15.17 C
7054 (4.2)	25.86 A	17.53 A	9060.1 A	15.86 C

When analyzed across treatments there were differences in tons/A, extractable sucrose/A and AUDPC but not % sucrose (Table 2.) The four applications of conventional fungicides provided the highest tons/A, extractable sucrose/A and the lowest AUDPC (Table 2.) Extractable sucrose/A yields were equivalent for the 4 applications of Bac J and 2 or 3 applications of conventional fungicides (Table 2.)

Table 2. Effect of fungicide treatments across all varieties

Treatment/A	Tons/A	% Sugar	Extractable Sugar lbs/A	AUDPC
1. Untreated- water check	25.03 C	17.61 A	8819.4 C	49.17 A
2. Eminent 13.0 oz (1)	26.06 B	17.57 A	9153.2 B	29.98 B
3. Eminent 13.0 oz(1), Gem 7.0 oz(2)	25.53 BC	17.66 A	9009.3 BC	18.92 BC
4. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3)	25.60 BC	17.65 A	9038.9 BC	8.54 E
5. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3), Headline 9.2 oz (4)	27.00 A	17.58 A	9496.6 A	4.57 F
6. Eminent 6.5 oz (1) + Bac J (1-4)	25.02 C	17.57 A	8788.3 C	26.14 C
7. Bac J (1-4)	25.77 BC	17.48 A	9007.3 BC	31.92 B

The effect of fungicide treatments on individual varieties are shown in Tables 3, 4, 5 and 6. Table 3 provides data on tons/A as affected by fungicide application. In general fungicide application increased yield the greatest on the most resistant varieties. Table 4 provides data on % sugar as affected by fungicide application. Percent sugar was unaffected by fungicide application on any variety. Table 5 provides information on extractable sucrose yields as affected by fungicide application. Yield was statistically unaffected by fungicide application on the most susceptible variety, Beta 2185, on HH 111 1-4 sprays increased yield equally, on the two varieties with KWS scores of 5 (HH 115 and Monarch) yield were unaffected by any spray program and on the most resistant varieties , yields were maximized by 3 sprays on Beta 3820 and by 1 spray on HM 7054. These data suggest that yield are maximized on varieties with KWS scores in the 4.4-4.2 range and that more susceptible varieties did not have sufficient fungicide protection to maximize yield in the 2002 season. However, this is not supported by the AUDPC data presented in Table 6. These data show that 3 or 4 sprays maximized disease control on all varieties. However, with the least significant difference of 3.9 AUDPC units for the experiment, it took 4 sprays on Beta 2185 and HH111 to equal the disease control with 3 sprays on HH 115, Beta 3820 and HM 7054. Thus, these varieties could have received 1 less spray and achieved equal disease control.

Table 3. Tons per acre as affected by variety and fungicide application

Treatment/A	HH 111	HH 115	Monarch	Beta 3820	HM 7054	Beta2185
1. Untreated- water check	23.32 B	25.51 A	26.06 A	25.01 B	25.52 BC	24.75 B
2. Eminent 13.0 oz	26.42 A	25.42 A	25.54 A	25.98 B	27.02 AB	26.01 AB
3. Eminent 13.0 oz(1), Gem 7.0 oz(2)	25.95 A	25.75 A	24.67 A	25.80 B	25.32 BC	25.68 AB
4. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3)	25.57 A	25.25 A	25.12 A	26.05 B	25.91 ABC	25.73 AB
5. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3), Headline 9.2 oz (4)	26.74 A	26.30 A	26.64 A	28.73 A	27.66 A	25.94 AB
6. Eminent 6.5 oz (1) + Bac J (1-4)	25.34 A	25.22 A	25.76 A	24.30 B	24.49 C	25.04 AB
7. Bac J (1-4)	25.67 A	24.95 A	25.96 A	25.91 B	25.09 C	27.03 A

Table 4. Percent sugar as influenced by fungicide application and variety

Treatment/A	HH 111	HH 115	Monarch	Beta 3820	HM 7054	Beta 2185
1. Untreated- water check	17.89 AB	17.60 A	17.67 A	17.44 A	17.68 A	17.39 A
2. Eminent 13.0 oz	17.99 A	17.51 A	17.70 A	17.33 A	17.21 A	17.71 A
3. Eminent 13.0 oz(1), Gem 7.0 oz(2)	17.55 A	17.76 A	17.65 A	17.49 A	17.75 A	17.75 A
4. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3)	17.94 A	17.70 A	17.62 A	17.86 A	17.57 A	17.23 A
5. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3), Headline 9.2 oz (4)	17.64 AB	17.61 A	17.64 A	17.67 A	17.63 A	17.28 A
6. Eminent 6.5 oz(1) + Bac J (1-4)	17.72 AB	17.71 A	17.56 A	17.56 A	17.30 A	17.57 A
7. Bac J (1-4)	17.28 B	17.53 A	17.54 A	17.52 A	17.60 A	17.43 A

Table 5. Extractable Sugar in lbs/A as influenced by fungicide application and variety

Treatment/A	HH 111	HH 115	Monarch	Beta 3820	HM 7054	Beta 2185
1. Untreated- water check	8342.3 C	8987.5 A	9223.0 A	8711.3 B	9025.5 BC	8626.6 A
2. Eminent 13.0 oz	9503.0 A	8900.6 A	9040.8 A	8986.0 B	9282.4 AB	9206.3 A
3. Eminent 13.0 oz(1), Gem 7.0 oz(2)	9093.1 AB	9142.7 A	8681.2 A	9029.4 B	8989.0 BC	9120.5 A
4. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3)	9159.3 AB	8939.2 A	8851.8 A	9305.0 AB	9100.6 ABC	8877.6 A
5. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3), Headline 9.2 oz (4)	9438.1 A	9263.6 A	9402.4 A	10,155.6 A	9737.7 A	8982.0 A
6. Eminent 6.5 oz(1) + Bac J (1-4)	8972.9 AB	8942.8 A	9037.6 A	8529.7 B	8450.1 C	8796.9 A
7. Bac J (1-4)	8854.3 BC	8746.4 A	9102.7 A	9081.1 B	8835.5 BC	9423.7 A

Table 6. Area under the disease progress curve as influenced by fungicide application and variety

Treatment/A	HH 111	HH 115	Monarch	Beta 3820	HM 7054	Beta 2185
1. Untreated- water check	61.57 A	61.10 A	55.25 A	30.18 A	33.80 A	53.14 A

Table 7. provides information on net $ returns per acre.

2. Eminent 13.0 oz	44.22 B	34.31 B	31.61 BC	19.72 B	18.67 B	31.36 B
3. Eminent 13.0 oz(1), Gem 7.0 oz(2)	25.90 C	20.90 C	23.07 C	14.88 B	15.07 B	13.68 DE
4. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3)	12.14 D	8.49 D	10.99 D	4.04 C	6.08 C	9.52 E
5. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3), Headline 9.2 oz (4)	5.99 D	5.58 D	3.67 D	3.40 C	4.20 C	4.56 E
6. Eminent 6.5 oz(1) + Bac J (1-4)	38.34 B	33.94 B	30.04 BC	16.03 B	15.71 B	22.76 CD
7. Bac J (1-4)	47.11 B	33.00 B	37.19 B	17.96 B	17.51 B	38.76 B

These data show that fungicide application was most profitable @ 2 applications on HH111, not profitable on HH115, Monarch or HM 7054 or Beta 2185, and @ 4 applications on Beta 3820. The greatest profit was derived by 2-3 applications on HH111, 4 applications on Beta 3820, 0-1 applications on HM 7054, 1 application on Beta 2185 or 4 application of Bac J on 2185.

Treatment/A	HH 111	HH 115	Monarch	Beta 3820	HM 7054	Beta 2185
1. Untreated- water check	1032	1103	1134	1069	1110	1061
2. Eminent 13.0 oz	1156	1069	1091	1079	1109	1112
3. Eminent 13.0 oz(1), Gem 7.0 oz(2)	1127	1082	1026	1062	1066	1082
4. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3)	1058	1041	1028	1089	1058	1020
5. Eminent 13.0 oz (1), Gem 7.0 oz (2), SuperTin 5.0 oz (3), Headline 9.2 oz (4)	1079	1056	1074	1167	1117	1011
6. Eminent 6.5 oz(1) + Bac J (1-4)	1067	1062	1071	1008	997	1042
7. Bac J (1-4)	1055	1042	1087	1086	1054	1125

Table 7. Net $ returns per acre by fungicide treatment and variety[1]

Returns based on Holly Sugar Rocky Mountain District Contract for 2002. Fungicide application was billed as $6.00 per application and the fungicides were charged @ $16.00 for Eminent, Gem and Headline, $9.00 for SuperTin and $0.50 for Bac J per application. The least significant difference at the 0.05 probability level is $33.00/ A

Conclusion: Net returns were higher and Cercospora disease severity was lower on the varieties with the best Cercospora resistance. These varieties offer the opportunity to utilize fewer fungicide applications and achieve equal returns. There does not appear to be a yield penalty for using varieties with higher levels of Cercospora leaf spot resistance. Use of these varieties should reduce fungicide application number and cost while placing less selection pressure on the fungus that could result in fungicide resistance or tolerance. The use of more tolerant varieties should reduce the amount of inoculum available for overwintering disease spread and should over time reduce disease severity. The Bacillus–based biological resulted in net returns equal to or greater than conventional fungicides on all but the most resistant varieties tested. These data are similar for the varieties Beta 2185, HH111 and HM 7054 tested in 2000 under low disease pressure and in 2001 under disease pressure similar to 2002. Performance under severe disease pressure is unknown and we hope to achieve this in 2003 by supplemental irrigation to increase disease severity.

2002 Fungicide Trial

Results of the 2002 fungicide trial conducted at Sidney, MT are shown in Table 8. The effective use of fungicides for control of CLS depends on the proper timing, application and use of fungicides that are effective on the local population of *C. beticola*. Data on Fungicide resistance or tolerance for this location are shown in Table 9.

Table 4. Fungicide resistance / tolerance to benzimidazole, strobilurin or triazole fungicides as measured by percent spore germination on agar amended with 10 ppm of the test fungicides.

Fungicide	1999	2001
Benzimidazole (Benlate)	5.0	68.5
Strobilurin (Quadris)	1.0	16.8
Triazole (Eminent)	2.5	60.8

These data show why fungicides tested in the 2002 trial were used only in a fungicide resistance management program. All fungicide programs reduced AUDPC and extractable sugar per acre was increased by the experimental fungicide HM 0125 alternated with Headline and the Eminent-Headline-AgriTin-Headline spray program

The importance of fungicide resistance management is critical in that over the past 4 years we have detected not only benzimidazole resistance but tolerance to TPTH at up to 5 ppm, tolerance to the new strobilurin class of fungicides (Gem, Headline, Quadris) at up to

10 ppm and tolerance to sterol biosynthesis inhibitor class fungicides (Tilt, Eminent) at up to 10 ppm. For this reason our research has focused primarily on the rotation of fungicide classes, integration of the biological Bac J and the potential integration of variety resistance to decrease fungicide selection pressure. The use of Bac J in fungicide resistance management programs has been shown over that past 4 years where fungicide resistance management has been studied. In these studies CLS infected leaves have been collected from every fungicide plot and isolates from these leaves have been evaluated for resistance or tolerance to TPTH, Benlate, Tilt/Eminent, Quadris/Headline /Gem as measured by conidial germination and inhibition of mycelial growth. Three observations can be made from these studies. 1) Tolerance as exhibited in conidial germination does not always reflect in inhibition of mycelial growth. 2) The rotation of fungicide classes generally results in the identification of only very low levels of resistant/tolerant isolates. 3) Where Bac J is co-applied with an effective fungicide or used in the fungicide rotation program no resistant/tolerant isolates have been found. It appears that incorporation of induced systemic resistance activators such as Bac J is another tool in managing fungicide resistance along with rotation of fungicide classes.

This research was supported by the Sugarbeet Research and Education Board (SBAR funds), the Montana Agricultural Experiment Station, USDA (NRI and Western Region IPM grants), Holly Sugar –Growers, Western Sugar, Syngenta, Bayer, BASF, Griffin, Helena and Sipcam Agro-USA.

Table 8. Results of Cercospora leaf spot research at Sidney, MT in 2003

Treatment/A	Tons/A	% sucrose	Extractable sugar lb/A	AUDPC
1. Untreated- water check	26.91 DEF	17.76 AB	9603 CDE	53.5 A
2. HM 0125 1.0 lb	27.18 CDEF	17.75 AB	9616 CDE	26.1 BCD
3. HM 0125 1.5 lb	26.07 F	17.65 AB	9278 E	41.0 AB
4. HM 0125 2.0 lb	28.09 BCDEF	16.76 B	9417 E	33.9 ABC
5. HM 0125 1.0 lb alt. with Headline 9.0 oz	28.93 ABCDEF	17.35 AB	10048 BCDE	10.4 DE
6. HM 0125 1.5 lb alt. with Headline 9.0 oz	27.02 DEF	17.97 A	9802 BCDE	10.9 DE
7. HM 0125 2.0 lb alt. with Headline 9.0 oz	31.95 A	17.59 AB	11257 A	14.4 CDE
8. Eminent 13.0 oz(1), Headline 9.2 oz(2) SuperTin 5.0 oz (3,4)	29.87 ABCD	17.26 AB	10328 ABCDE	13.4 DE
9. Eminent 13.0 oz(1), Quadris 9.2 oz(2) SuperTin 5.0 oz (3,4)	28.79 ABCDEF	17.34 AB	10005 BCDE	12.7 DE
10. Eminent 13.0 oz(1), A13705 200g (2) SuperTin 5.0 oz (3,4)	30.03 ABCD	17.07 AB	10258 ABCDE	5.4 E
11. Quadris 0.15 oz ai/1000 row ft-4 leaf, (1), Eminent 13.0 oz (2)A13705 200g (3,4), SuperTin 5.0 oz	29.86 ABCD	17.68 AB	10567 ABCD	12.4 DE
12. Quadris 0.15 oz ai/1000 row ft-4 leaf, (1) A13705 200g. (2) SuperTin 5.0 oz, (3, Eminent 13.0 oz, (4) SuperTin 5.0 oz	27.14 CDEF	17.50 AB	9527 DE	12.5 DE
13.Headline 9.2 oz (1), AgriTin 5.0 oz (2) Eminent 13.0 oz (3), Headline 9.2 oz (4)	30.02 ABCD	17.28 AB	10384 ABCDE	13.6 DE
14. Headline 9.2 oz (1), Eminent 13.0 oz (2) AgriTin 5.0 oz (3), Headline 9.2 oz (4)	29.06 ABCDEF	17.03 AB	9934 BCDE	12.8 DE
15. Eminent 13.0 oz (1), Headline 9.2 oz (2) AgriTin 5.0 oz (3), Headline 9.2 oz (4)	30.75 AB	17.70 AB	10857 AB	8.4 DE
16. Gem 7.0 oz (1), Eminent 13.0 oz (2) AgriTin 5.0 oz (3), Gem 7.0 oz (4)	29.24 ABCDEF	17.37 AB	10181 ABCDE	9.7 DE
17. Eminent 13.0 oz (1), Gem 7.0 oz (2) AgriTin 5.0 oz (3), Eminent 13.0 oz (4)	28.47 BCDEF	17.08 AB	9759 BCDE	8.8 DE
18. Eminent 13.0 oz (1), Headline 9.2 oz (2) Topsin 0.5 lb (3), Eminent 13.0 oz (4)	30.32 ABC	17.71 AB	10707 ABC	8.1 DE
19. Eminent 13.0 oz (1), Headline 9.2 oz (2) Topsin 1.0 lb (3), Eminent 13.0 oz (4)	29.29 ABCDE	17.29 AB	10125 BCDE	18.1 CDE
20. Eminent 13.0 oz+Bac J (1), Bac J (2,3,4)	26.54 EF	17.48 AB	9306 E	26.2 BCD