

SMBSC Evaluation of Phosphorus and its Influence on Sugarbeet Growth 2010-2012

Sugarbeets were planted at one location in 2010 at Maynard, MN and one location in 2011 at Cosmos, MN. There were two locations in 2012, one at Clara City, MN and one at Wood Lake, MN. The data will be presented combined over the four locations. Analysis of the data was conducted for homogeneity of combinability and determined that the data could be combined across environments.

Methods

Table 1-4 shows the specifics of activities conducted at each site. Plots were 11 ft. (6 rows) wide and 35 ft. long. Phosphorus fertilizer source 0-46-0 was applied with urea in order not to add a nitrogen variable with phosphorus sources such as 11-52-0 or 18-46-0. Phosphorus fertilizer indicated as P-rate in the data table was applied at rates of 0, 15, 30, 45 and 60 lbs. per acre. Sugarbeets were planted with a 6 row planter. Starter fertilizer was 10-34-0 applied at a 3 GPA rate. The starter was mixed with water at a 1:1 ratio and was applied at 6 GPA mix in-furrow on the seed. Harvest data was collected from the middle two rows of a 6 row plot. Research trials were harvested with a 2 row research harvester. At Cosmos and Clara City the whole plot length was harvested and weighed. One quality sub-sample was collected from each plot and analyzed for quality at the SMBSC Tare Lab. The Wood Lake research trial was harvested with a 1 row research harvester. At Wood Lake two quality sub-samples were collected from each plot and analyzed for quality and weighed for yield calculation. Each sample was collected from 10 feet of row. Plots were not thinned as the sugarbeet stands did not warrant thinning.

Results and Discussion

The data is presented separately for each location and is also presented as combined data for locations 1120 and 1221. Sugarbeet quality was not significantly enhanced at the majority of the sites and did not follow any relationship to starter or phosphorus fertilizer application. Thus the influence of starter or phosphorus fertilizer on sugarbeet quality was considered to be random. In general the results showed that application of broadcast phosphorus fertilizer incorporated into the soil plus starter fertilizer gave greater yields than without starter fertilizer. In 2010 the use of starter fertilizer was highest when 15 pounds of phosphorus fertilizer was applied to the soil. In 2011 and 2012 the application of phosphorus fertilizer at rates of 60 lbs. per acre showed to be more advantageous than lower rates of phosphorus fertilizer when applied with starter fertilizer. The combined locations in 2011 and 2012 showed that tons and revenue increased as the rate of phosphorous increased. The sugar percent was not affected by the use of starter fertilizer. Starter fertilizer applied without phosphorous fertilizer incorporated performed better than any treatment that did not have starter applied. This testing of phosphorous rate supports the previous work showing a benefit to the use of starter fertilizer for sugarbeet production. These results also show the benefit of incorporating phosphorus fertilizer even when using starter fertilizer. The data would indicate that at a minimum 15 pounds of phosphorus fertilizer should be applied to optimize sugarbeet yields. Greater amount of phosphorus fertilizer (up to 60 lbs.) applied broadcast to the soil was shown to be beneficial at a majority of the test sites.

The test showed the current University phosphorous recommendation is accurate. At Maynard and Cosmos the current recommendation was to add 35lbs P₂O₅, at Wood Lake 10 lbs P₂O₅ was needed and at Clara City 55 lbs P₂O₅ was the recommendation.

Table 1. Site Specifics for Starter by Phosphorus Rate Testing Maynard, 2010

DATE	PLANTED	SPACING	SOIL	APPLIED	RATE	WEATHER
4/23/2010	X	4 3/8"	Moist			
6/7/2010				Roundup/Max	32 oz	75' Cloudy, E-5
7/6/2010				Roundup/Max	32oz	70' Cloudy, NE-5
7/27/2010				Supertin	7oz	90' Pcloudy, SW-5-10
	pH	N1 lb	N2 lb	N3 lb	Total N	P-O ppm
	7.8	74.5	48.8	48.0	171.3	10.0

Table 2. Site Specifics for Starter by Phosphorus Rate Testing Cosmos, 2011

DATE	PLANTED	SPACING	SOIL	APPLIED	RATE	WEATHER
5/18/2011	X	4 9/16"	Boggy			
7/13/2011				Powermax	32 oz.	71' Pcloudy E-11
				Select Max	7 oz.	
				Eminent	13 oz.	
	pH	0-6 in. N lb	6-24 in. N lb	24-48 in. N lb	Total N	P-O ppm
	6.9	13.8	27.8	26.0	67.5	8.0

Table 3. Site Specifics for Starter by Phosphorus Rate Testing Wood Lake, 2012

DATE	PLANTED	SPACING	SOIL	APPLIED	RATE	WEATHER
4/25/2012	X	4.75	Dry			
6/12/2012				Roundup PowerMax	32 oz.	50' Pcloudy, NE-9
6/28/2012				Roundup PowerMax	32 oz.	82' Sunny, N-3
				SelectMax	6 oz.	
7/2/2012				Eminent	13 oz.	93' Sunny, S-12
				Manzate	1.5qt	
7/18/2012				Supertin WP	8 oz.	76' Cloudy, E-4
				Roundup PowerMax	44 oz.	
8/1/2012				Gem	3.5 oz.	82' Pcloudy, S-6
	pH	N1 lb	N2 lb	N3 lb	Total N	P-O ppm
	7.6	28.3	84.8	42	155	13

Table 4. Site Specifics for Starter by Phosphorus Rate Testing Clara City, 2012

DATE	PLANTED	SPACING	SOIL	APPLIED	RATE	WEATHER
4/23/2012	X	4.75	Damp			
5/15/2012				Roundup PowerMax	32 oz.	65' Sunny, SSW-8
5/30/2012				Roundup PowerMax	32 oz.	85' Cloudy, S-1
7/3/2012				Eminent	13 oz.	82' Sunny, SW-4
				Manzate	1.5qt	
7/17/2012				Supertin WP	8 oz.	84' Cloudy, ENE-4
				Roundup PowerMax	44 oz.	
8/1/2012				Gem	3.5 oz.	73' Pcloudy, S-7
	pH	N1 lb	N2 lb	N3 lb	Total N	P-O ppm
	8	25	107	112	244	6.5

Table 5. With and without Starter - Phosphorus Rate influence on Sugarbeet Production Maynard, 2010

Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	25.7	16.97	92.20	7494	92.45
2	Yes	15	36.0	16.62	91.17	10149	122.00
3	Yes	30	29.4	16.69	91.78	8412	102.33
4	Yes	45	21.3	16.31	91.74	6094	74.10
5	Yes	60	29.4	16.75	90.86	8326	100.53
6	No	0	26.1	16.90	91.38	7549	92.65
7	No	15	27.7	16.39	91.07	7778	93.21
8	No	30	27.3	16.67	90.70	7692	92.44
9	No	45	26.8	16.40	91.45	7524	90.23
10	No	60	27.5	16.09	90.82	7481	87.31
		C.V	12.7	1.49	0.72	11	9.06
		LSD (0.05)	6.2	NS	NS	1845	24.43

Table 6. With and without Starter - Phosphorus Rate influence on Sugarbeet Production Cosmos, 2011

Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	12.4	15.77	89.91	3269	90.92
2	Yes	15	15.0	15.77	90.02	3942	109.74
3	Yes	30	16.4	15.11	89.02	4069	107.72
4	Yes	45	16.0	15.65	90.22	4187	116.13
5	Yes	60	17.8	15.36	90.15	4569	124.54
6	No	0	11.8	15.32	91.83	3074	85.21
7	No	15	13.0	15.64	89.77	3372	92.97
8	No	30	13.8	14.93	89.43	3403	89.58
9	No	45	13.0	15.61	90.39	3390	94.01
10	No	60	12.3	15.59	90.00	3197	88.11
C.V			8.3	3.39	1.79	9	11.61
LSD (0.05)			1.7	NS	NS	500	16.84

Table 7. With and without Starter - Phosphorus Rate influence on Sugarbeet Production Clara City, 2012

Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	33.4	18.33	87.75	9945	104.53
2	Yes	15	35.5	17.39	87.89	10076	103.61
3	Yes	30	36.4	18.05	87.94	10685	111.56
4	Yes	45	37.1	18.01	88.38	10950	114.59
5	Yes	60	38.4	18.61	89.22	11885	126.98
6	No	0	25.4	18.29	89.35	7735	82.05
7	No	15	29.9	18.14	88.66	8901	93.55
8	No	30	28.2	18.24	89.13	8522	90.19
9	No	45	27.2	18.56	89.17	8391	89.45
10	No	60	26.0	18.27	89.06	7883	83.51
CV%			9.0	4.07	1.31	11	12.99
LSD (0.05)			4.2	1.08	NS	1556	18.85

Table 8. With and without Starter - Phosphorus Rate influence on Sugarbeet Production Wood Lake, 2012

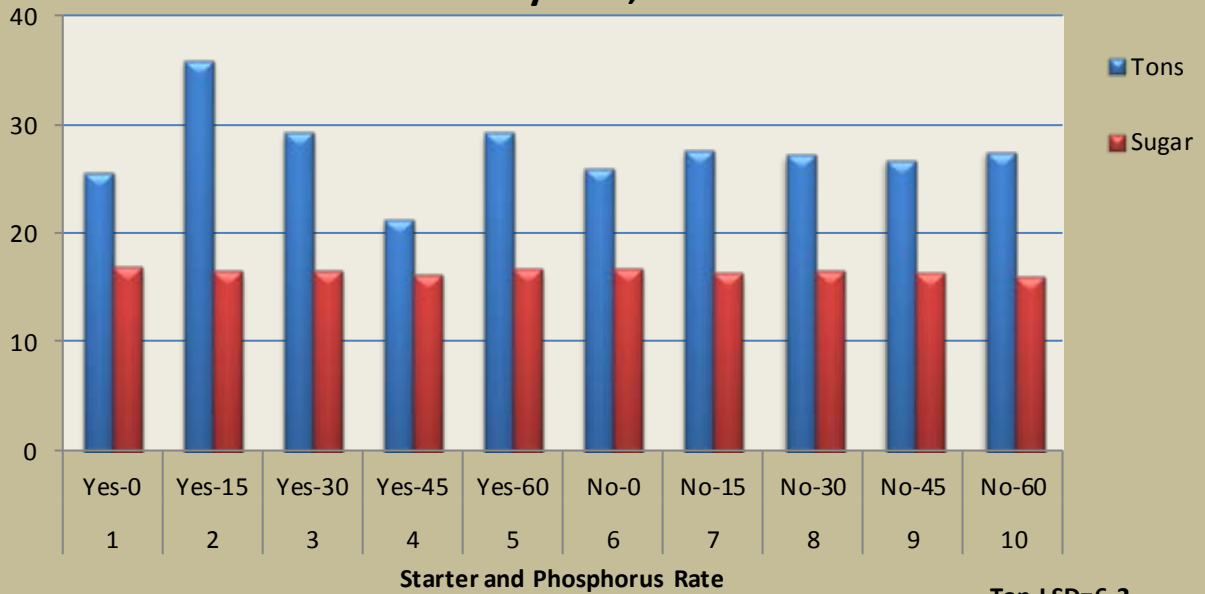
Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	24.7	13.92	92.64	5887	93.83
2	Yes	15	26.9	12.83	93.13	5895	88.97
3	Yes	30	30.9	13.70	92.94	7275	115.10
4	Yes	45	31.9	12.20	92.54	6571	94.79
5	Yes	60	30.9	13.30	93.47	7106	110.90
6	No	0	28.0	13.52	92.01	6536	102.84
7	No	15	28.0	13.51	92.09	6407	99.49
8	No	30	25.8	13.69	92.86	6062	95.83
9	No	45	28.5	13.67	92.01	6622	103.87
10	No	60	26.8	13.41	91.90	6096	94.38
CV%			12.4	7.57	1.42	14	17.81
LSD (0.05)			5.1	1.47	NS	NS	25.84

Table 9. With and without Starter - Phosphorus Rate Influence on Sugarbeet Production, Combined (1121-1220) 2011-2012

Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	22.9	17.05	88.83	6609	97.79
2	Yes	15	25.3	16.58	88.95	7016	107.03
3	Yes	30	26.4	16.58	88.48	7381	109.81
4	Yes	45	26.6	16.83	89.30	7566	115.22
5	Yes	60	28.1	16.98	89.68	8232	126.03
6	No	0	18.6	16.80	90.59	5397	83.26
7	No	15	21.4	16.89	89.22	6133	93.10
8	No	30	21.0	16.59	89.28	5963	89.93
9	No	45	20.1	17.08	89.78	5897	92.03
10	No	60	19.2	16.93	89.53	5540	85.80
CV%			8.4	3.29	1.59	12	10.78
LSD (0.05)			2.0	0.57	1.47	813	11.13

Fig. 1

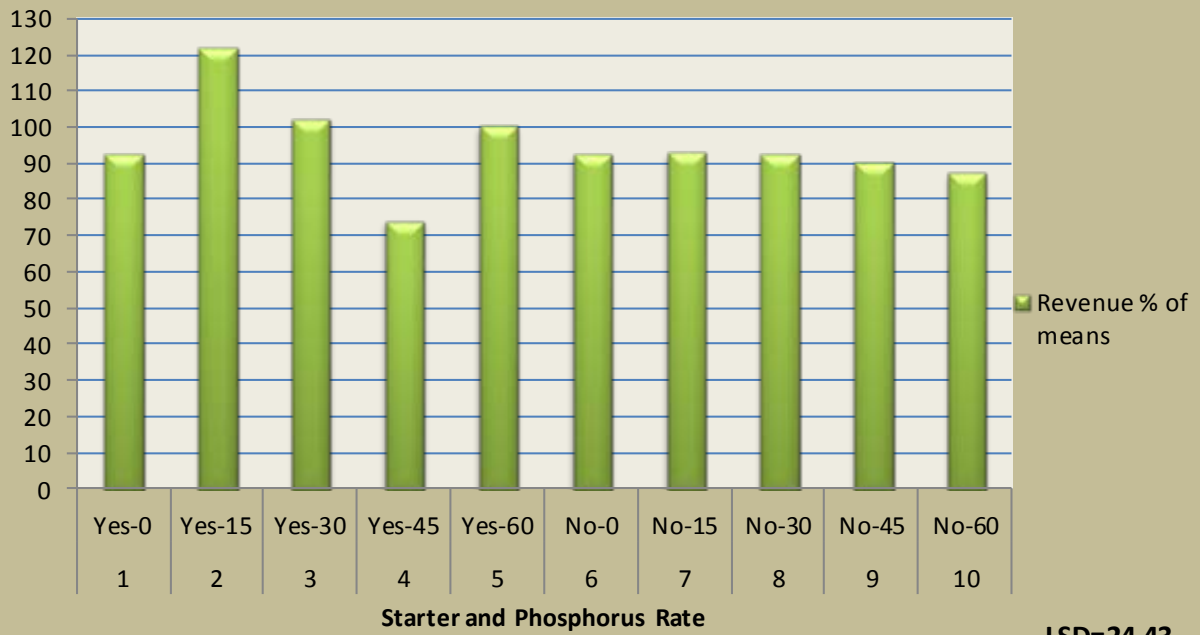
With and Without Starter - Phosphorus Rate Maynard, 2010



Ton LSD=6.2
Sugar LSD=NS

Fig. 2

With and Without Starter - Phosphorus Rate Maynard, 2010



LSD=24.43

Fig. 3

With and Without Starter - Phosphorus Rate Cosmos, 2011

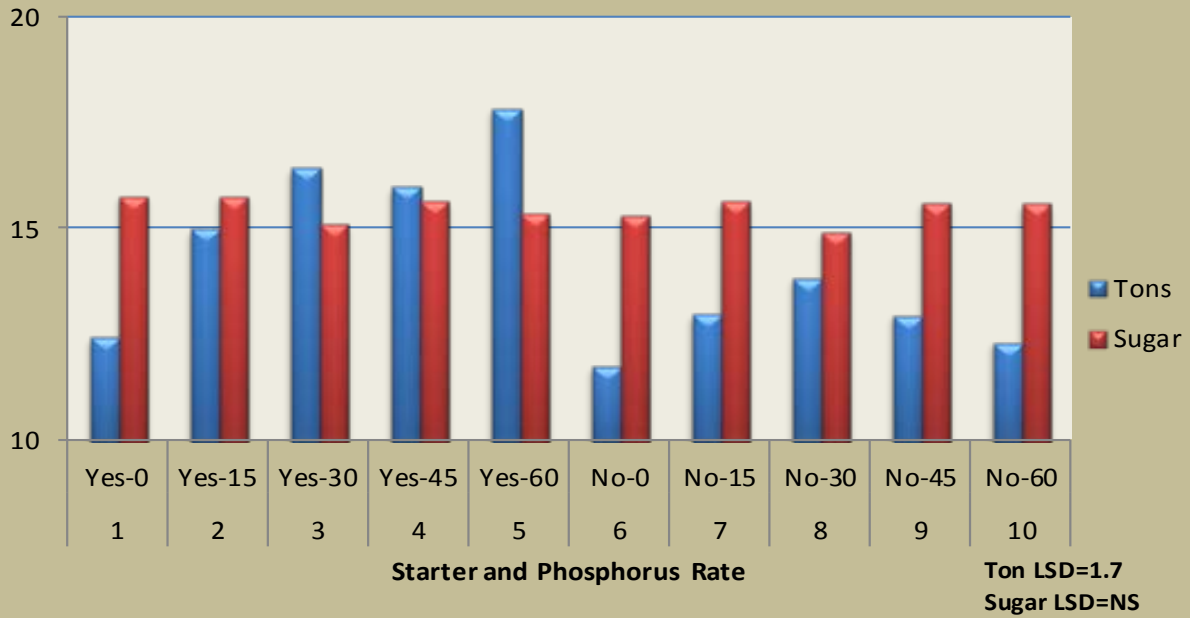


Fig. 4

With and Without Starter - Phosphorus Rate Cosmos, 2011

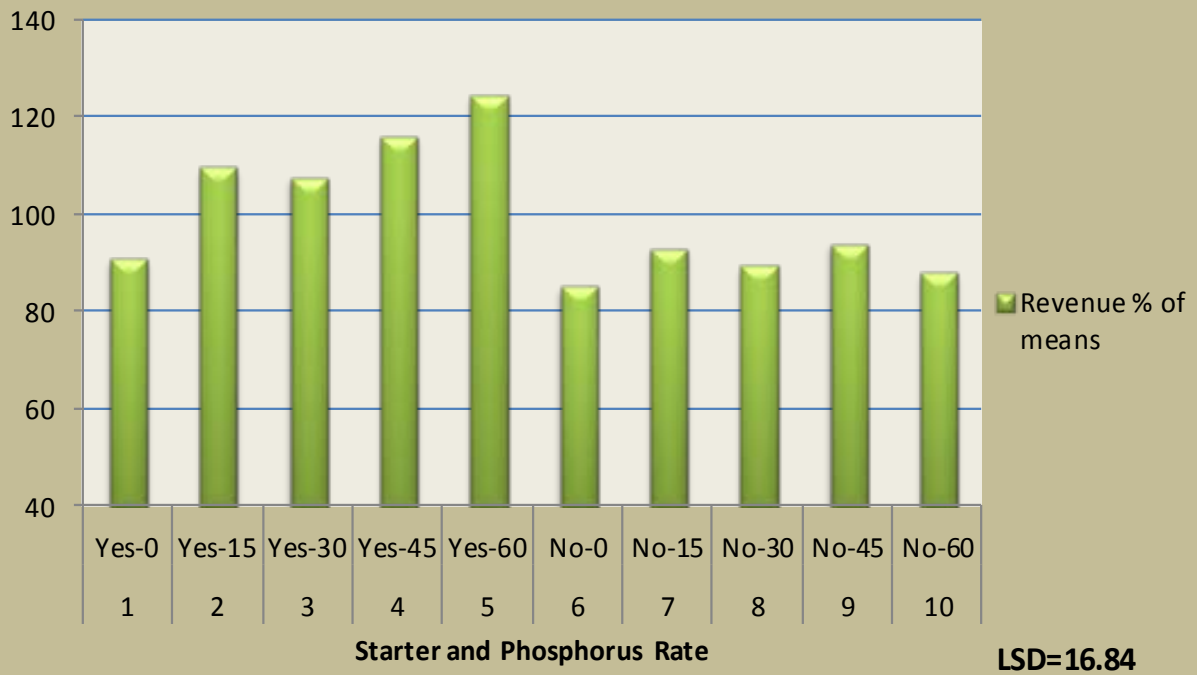


Fig. 5 **With and Without Starter - Phosphorus Rate**
Clara City, 2012

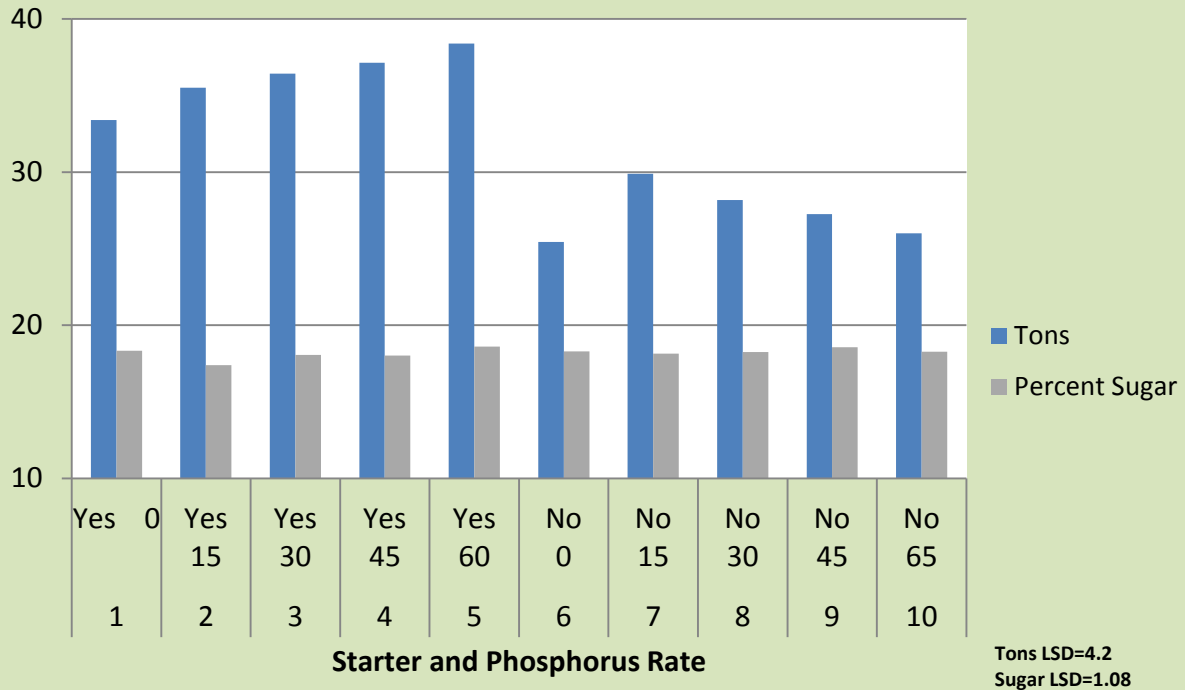


Fig. 6 **With and Without Starter-Phosphorus Rate**
Clara City, 2012

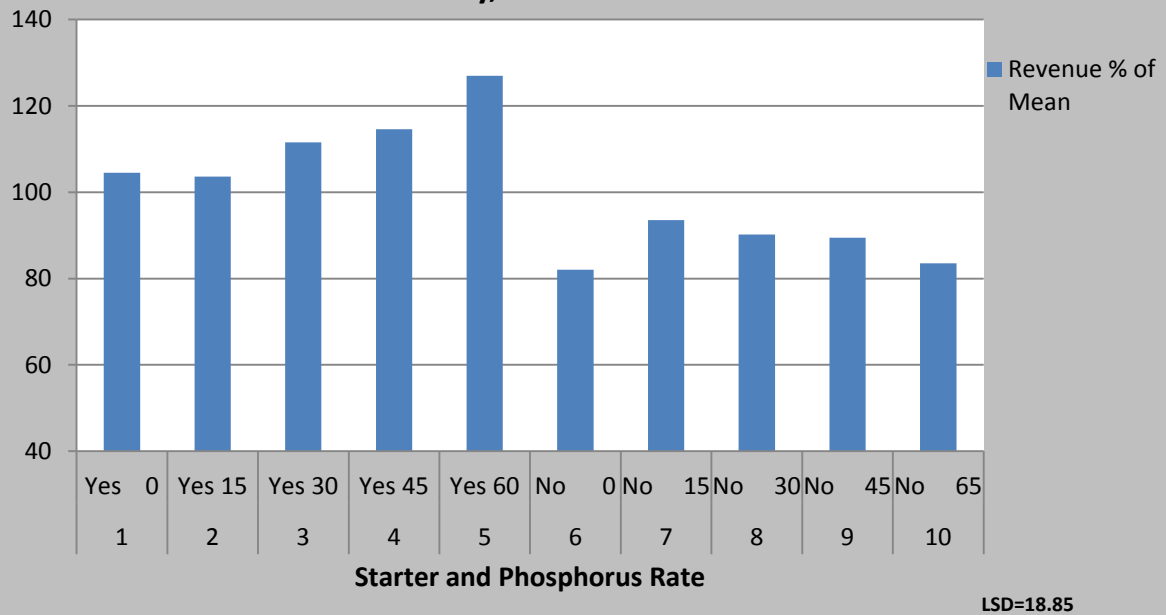
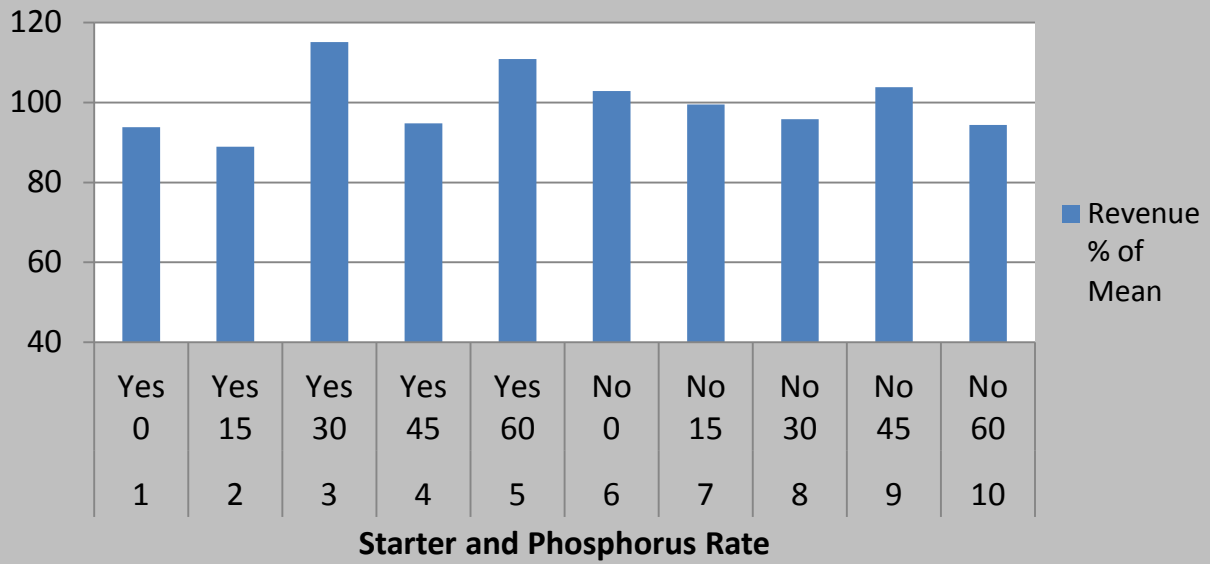


Fig 7

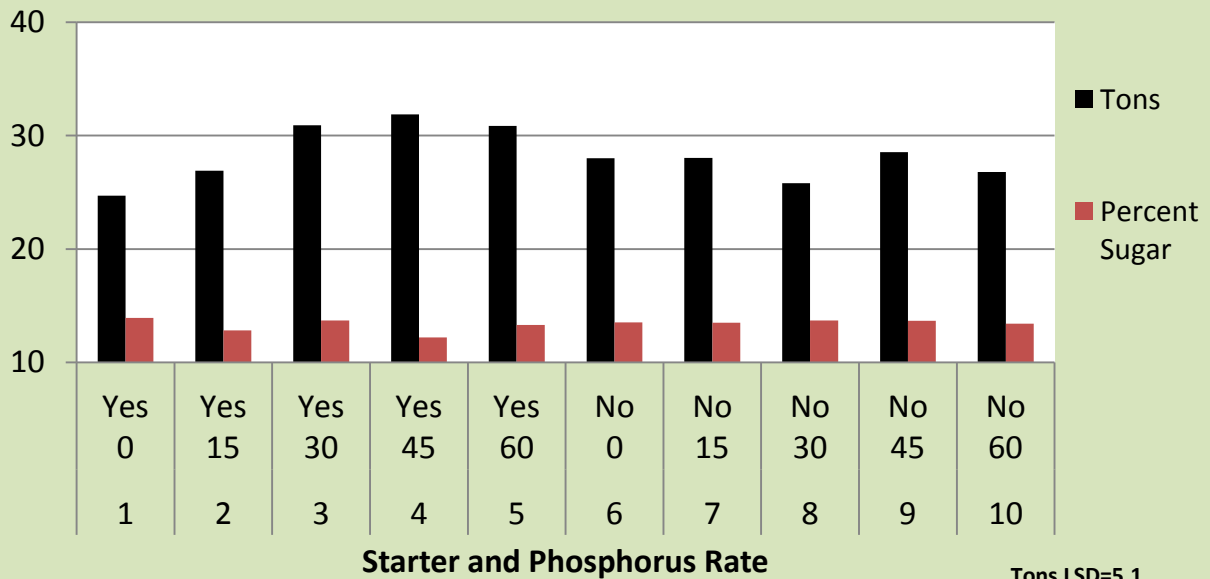
With and Without Starter - Phosphorus Wood Lake, 2012



LSD=25.84

Fig. 8

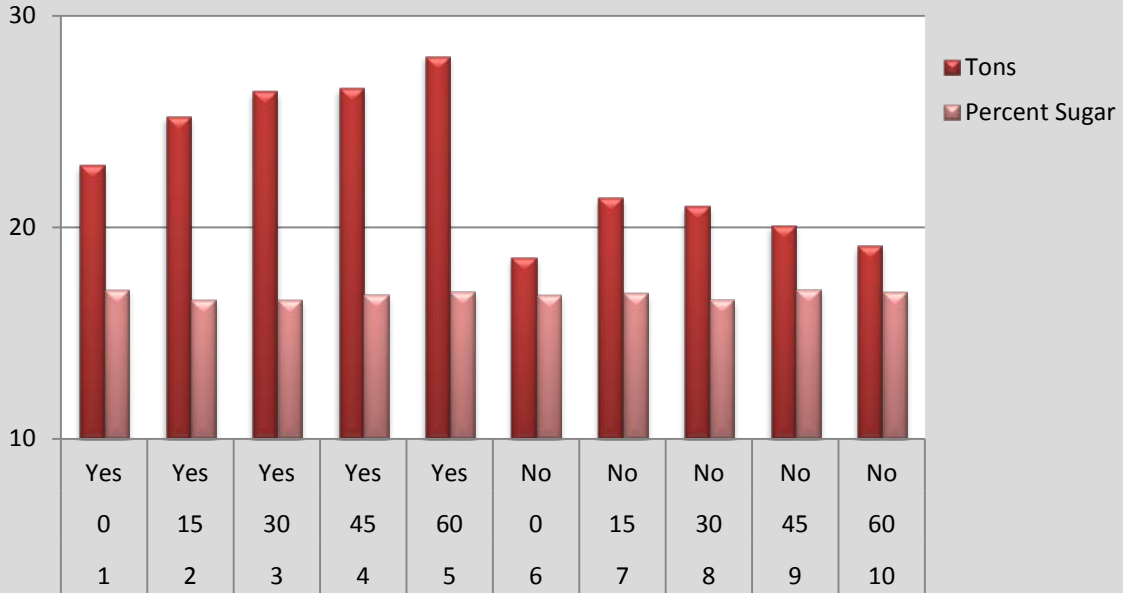
With and Without Starter - Phosphorus Wood Lake, 2012



Tons LSD=5.1
Sugar LSD=1.47

Fig. 9

With and Without Starter-Phosphorus Combined (1121 & 1220) 2011-2012

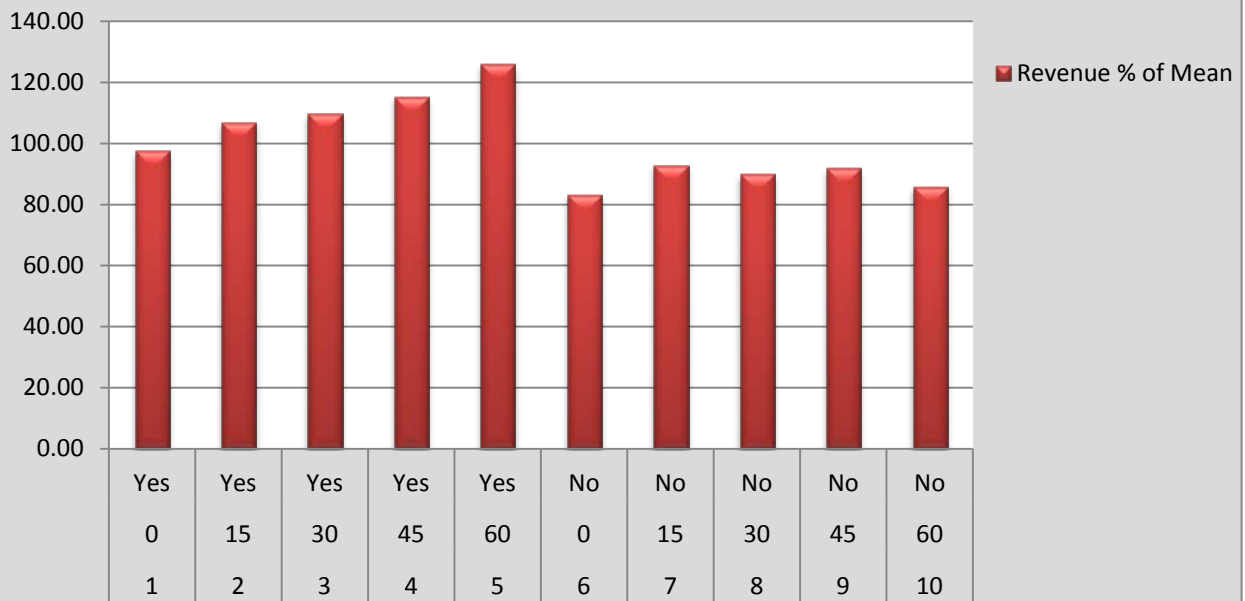


Starter Phosphorus Rate

Tons LSD=2.0
Sugar LSD=0.57

Fig. 10

With and Without Starter- Phosphorus Rate Combined (1121 & 1220) 2011-2012



Treatment, Product and Application Rate

LSD=11.13