The effect of Urea fertilizer drilling on yield of sugar beet

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Abstract: To determine the optimum level of nitrogen intake, assessment methods and nitrogen fertilizer application partitioning, a randomized complete block design with three replications in Agricultural Research Center of Hamedan in 1999 for two years was carried out. Fertilizer levels were (0 kg) as control ,120 ,180 and 240 kg/ha N for fertilizer drilling method in both sides of seedlings , and 240 kg/ha for fertilizer drilling in rills and surface broadcasting of 240 kg/ha. All treatments had two partitioning of 3 and 4 which were used. In 2001 the method of fertilizer falling in rills and consumption rate of 204.07 kg Urea per ha created the highest income. Results of ANOVA and Duncan mean comparison method showed that during two years of project implementation, the effect of N fertilizer level on root yield, sugar and sugar can be obtained ,at 5 percent level were significant and levels of N application as non-linear increased These components. Effect of method of fertilizer application on the above components is significant and by using the equipment of fertilizer drilling machine nitrogen consumption can be reduced and that and by creasing levels of fertilizer, yield of sugar beet increased compared to broadcast method to the surface. Effect of number of fertilizing stages (3 and 4 times) on root yield, income, gross and white sugar is not significant..
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1. Introduction

Routine application of nitrogen fertilizer by farmers is a surface spread method. Despite the simplicity and flexibility of this method with different conditions, large quantities of nitrogen that is consumed in this regard is inappropriate. This method as often by hand operation or with the help of centrifuge device is executed. Creating burn leaves, and on waste nitrogen through volatilization and deep percolation in this method compared with other methods of application is higher (Dahl, 2001 and Johnston, 2000).

In another study it was mentioned that seed yield of canola increase 38% with increasing nitrogen fertilizer amount which be drilled. Reaction of amount of product compared to a splitter device of fertilizer drilling varied. When the splitter by Flexi coil was used, amount of product was greeter than the other cases. In this study the difference in yield between treatments using four types Splitter did not observed. This shows the reaction of plants to the position of fertilizer inside the soil. Since the fertilizer drilling within the soil affects competing of plant and weeds, so taking place in the appropriate code has a large effect on plant yield (Johnston, 2000).

Bowen and colleagues in a study in Bangladesh reported that the deep fertilizer drilling with urea increased fertilizer use efficiency and with less use of fertilizer in fertilizer drilling method the rice yield was greeter compared to using surface spray (Bowen et al. 2004).

In a field experiment in 2007 in a silty clay soil in U.S.A , comparison of placement of nitrogen fertilizer in one side of plant row or two sides carried out. Corn was planted on ridges 40 inches wide and two levels of 150 and 240 pounds per acre. Fertilizer N in 2 inches depth and in steps 2 to 3 leaf with blades for fertilizer drilling in one row and two rows was planted. In that furrows which fertilizer drilling was made near the plant rows, the plant row close to fertilizer tape produced 42% greeter product. Fertilizer level effect on corn yield was not significant. Fertilizer drilling in one side of plant increased yield value of 9.6% compare to planting fertilizer in both sides. In stacks with two plant rows, planting fertilizer in both sides of plant rows made 4.9% yield increasing compared to planting fertilizer in one side .The amount of nitrogen absorbance showed the same trend. It seems blades negativly impact on plant in the case of bilateral fertilizer drilling caused yield reduction compared to fertilizer drilling in one side (Mascagni and Bubba, 2007).

Vyn and West (2007) reported that negative effects of fertilizer planting on strip according to the distance of the plant row from the fertilizer strip can be reduced by lowering the amount of fertilizer. Even it is possible planting on the fertilizer row and produce greeter yield.

In another study a significant difference in the number of grain in clusters according to different times of using fertilizer N was observed. Increasing nitrogen fertilizer in three times and equal amounts caused the most number of grains per clusters. Fertilizer drilling even with the less fertilizer use than the method of spraying fertilizer, caused the production of the largest number of grains per clusters (Saleem et al. 2009).

Research in response to the irrigation system and methods for corn fertilization was investigated. In this research it was found that furrow irrigation and fertilizer nitrogen drilling significantly related to leaf area per plant increase. Also the number of grains per cluster and thousand grains weight increased by using this irrigation and fertilization method . Fertilizer N drilling by amount of 6.72% compared to broadcasting increased corn grain yield. Fertilizer N drilling increased the speed of plant growth (the coefficient CGR) compared with broadcasting. Increasing of this factor in this method of fertilizing is due to increased leaf area and plant dry weight (Ahmad et al., 2002).

In another study on the effect of fertilizer placement and the the time of usage on accumulation of nitrogen, phosphorus and potassium in shoots of wheat plants in East Europe the highest concentration of these elements in plant tissues in the tillering stage was observed (Masaka, 2005).

Another conclusion was made that correlation coefficients that determine plant characteristics can help to estimate the various characteristics associated with plant fertilization technique that can predict the value for the product to be used on any plant (Burio, 2004) .

To determine the optimum level of nitrogen intake, assessment methods and nitrogen fertilizer application partitioning this research was carried out in Ekbatan agricultural research center of Hamedan province of Iran.

2. Material and Methods

In1999 to 2000, field crops in the area about 8000 square meters located at the research station Ekbatan for the Project was considered. Land preparation operations conducted in the fall of 1998 with subsoiler in depth of 40 cm and a moldboard plow depth of 30 cm was performed. Before cultivation from different parts of the land, soil samples from depth of 0-30 cm for routine analysis of soil and fertilizer recommendations prepared, and soil electrical conductivity and soil texture was determined. Supper phosphate fertilizer rate of 50 kg per hectare consumption was determined. N fertilizer was in source of Urea .An experiment with 15 treatments in a randomized complete block design with three replications carried out. Experimental treatments include:

1 - 240 kg N/ha with the method of falling in rills and four partitions (1/4 at planting, 1/ 4 after the tender and weeding, 1/4 at 20 days after the tender and weeding and the final 1 / 4 at 40 days after tender and weeding).

2 - 240 kg N/ha with the method of falling in rills and three partitions (1/3 at planting,1/3 after the tender and weed and final 1/4 at 20 days after the tender and weeding).

3 - 180 kg N/ha with the method of fertilizer drilling into rills in three partitions.

4-180 kg N/ha with the method of fertilizer drilling into rills in four partitions.

5 - 120 kg N/ha with the method of fertilizer drilling into rills in three partitions.

6-120 kg N/ha with the method of fertilizer drilling into rills in four partitions.

7-240 kg N/ha fertilizer with the drilling method laid out in both sides of the seedlings in three partitions.

8-240 kg N/ha fertilizer with the drilling method laid out in both sides of the seedlings in four partitions.

9-180 kg N/ha fertilizer with the drilling method laid out in both sides of the seedlings in three partitions.

10 - 180 kg N/ha fertilizer with the drilling method laid out in both sides of the seedlings in four partitions.

11 - 120 kg N/ha fertilizer with the drilling method laid out in both sides of the seedlings on three partitions.

12 - 120 kg N/ha fertilizer with the drilling method laid out in both sides of the seedlings in four partitions.

13 - 240 kg N/ha surface broadcasting method in three partitions.

14 -240 kg N/ha surface broadcasting method in four partitions.

15 - The treatment without N application.

To determine the quantitative and qualitative characteristics of each experimental plot two samples on each plant row each of 4.8 m randomly selected and the number of roots counted and weighed after washing. Two samples pulp prepared to measure qualitative traits and were sent to the laboratory and the results were statistically analyzed.

3. Results and Discussions

- Results of the first year:

Table 1 shows the Effect of different treatments on the average root yield in the first year of implementation. As this table shows by 240 kg N/ha treatment and method of fertilizer drilling and four partitions (the treatment No. 8) by statistical analysis shows the highest yield. But this treatment and using 120 kg N/ha and method of fertilizer drilling and four partitions (treatment No. 12) have no significant difference. On the other hand between the amount of 120 kg of nitrogen fertilizer on three partitions (treatment No. 11) and four partitions (treatment No. 12) have no significant difference. Therefore the dosage of 120 kg N treatments in three partitions is superior to advise. This treatment in terms of yield with 240 kg dosage treatments to surface broadcast method 3 and 4 partitions (treatments 13 and 14) gives equal and is better due to lower operating fertilization of the nitrogen compared to treatment, 4 partitions. Probably better than being available nitrogen for the acts of the root causes of such advantages

Table No. 1:

1	10	9	7	8	Treat.No.
60.35	60.49	61.04	55.21	62.85	Mean root yield(T/ha)
ab	ab	ab	a	a	group

12	6	2	3	4	Treat.No.
52.64	55.21	55.76	57.22	58.20	Mean root yield(T/ha)
abc	abc	abc	abc	abc	group

15	14	5	13	11	Treat.No.
31.25	48.13	49.65	50.63	50.69	Mean root yield(T/ha)
d	c	bc	bc	bc	group

Means in each column with common letters has no statistically difference.

Table 2, shows the effect of different treatments on the average gross sugar in the first year implementation. According to this chart, number eight treatment (240 kg N/ha fertilizer drilling in four partitions) in terms of sugar production also has obtained the highest yield. This trend also observed for corn by Ahmad and co-workers (2002). Here treatment No. 12 (120 kg N fertilizer drilling in four partitions) has no difference with this treatment. On the other hand between treatments No. 11 (120k/ha fertilizer drilling in three partitions) and 12 (120kg/ha nitrogen by method of fertilizer drilling in four partitions) was not a significant difference. Therefore the reasons mentioned before (less fertilizer and agricultural operations and less frequency) treatment No. 11 (120 kg/ha fertilizer drilling in three partitions) as the best treatment can be recommended.

Table No. 2:

12	3	2	10	6	Treat.No.
9.71	9.88	9.89	1028	10.33	Mean root yield(T/ha)
ab	ab	ab	ab	ab	group

9	4	1	8	7	Treat.No.
10.54	10.73	10.81	10.81	11.51	Mean root yield(T/ha)
ab	ab	ab	ab	a	group

15	5	14	13	11	Treat.No.
5.70	8.79	8.86	8.95	9.36	Mean root yield(T/ha)
c	b	b	b	b	group

Means in each column with common letters has no statistically difference.

Table 3 shows the Effect of different treatments on the mean white sugar production in the first year of implementation. As this table shows treatment No. 7 (240 kg/ha nitrogen by method of fertilizer drilling in three partitions) had the highest amount of white sugar production. This trend also observed by Davilrs and co-workers(2002),Masaka reported such s trend in 2005 for wheat also. The treatment, 11 (120 kg/ha nitrogen by the method of fertilizer drilling in three partitions) was not significantly different.

Table No. 3:

6	8	1	4	7	Treat.No.
9.19	9.25	9.41	9.57	10.17	Mean root yield(T/ha)
ab	ab	ab	ab	a	group

2	3	12	10	9	Treat.No.
8.26	8.64	8.69	8.84	9.14	Mean root yield(T/ha)
ab	ab	ab	ab	ab	group

15	5	13	14	11	Treat.No.
5.10	7.76	7.82	7.93	8.42	Mean root yield(T/ha)
c	b	ab	ab	ab	group

Means in each column with common letters has no statistically difference.

- Results of the second year:

Table 4 shows the effect of different treatments on the average root yield in the first year of implementation. According to this table, treatment No. 7 (240 kg N/ha by method of fertilizer drilling in three partitions) has obtained the highest yield. But

the treatment No. 12 (120 kg N/ha by method of fertilizer drilling in four partitions) in terms of root yield has no significant difference. Therefore, the implementation of experimental treatments in the second year shows the No. 12 the best treatment for recommendation. It should be mentioned that the effect of different treatments on percentage of sugar production is not significant

Table No. 4:

6	2	1	4	7	Treat.No.
58.13	58.51	60.76	61.15	68.05	Mean root yield(T/ha)
abc	abc	ab	ab	a	group

13	12	3	14	10	Treat.No.
51.35	55.31	57.43	57.64	58.25	Mean root yield(T/ha)
abcd	abc	abc	abc	abc	group

5	11	15	8	9	Treat.No.
39.03	42.84	43.33	48.75	50.45	Mean root yield(T/ha)
d	cd	cd	abcd	abcd	group

Means in each column with common letters has no statistically difference.

- Integrated two-year results:

Table 5 shows the effect of different treatments on the root mean yield performance in two years.

Table No. 5:

6	2	1	4	7	Treat.No.
9.19	58.51	9.41	9.57	10.17	Mean root yield(T/ha)
ab	abc	ab	ab	a	group

13	12	3	14	10	Treat.No.
50.15	54.91	57.23	56.74	57.35	Mean root yield(T/ha)
abcd	abc	abc	abc	abc	group

5	11	15	8	9	Treat.No.
38.83	42.44	42.93	48.55	51.05	Mean root yield(T/ha)
d	cd	cd	abcd	abcd	group

Means in each column with common letters has no statistically difference based on Duncan test at 5% level of probability.

As the table above shows the treatment No. 7 (240 kg/ha N by method of fertilizer drilling in three partitions) in two years of experiment produced the highest root yield .This treatment whit the treatment No. 12 (120 kg/ha N by method of fertilizer drilling in four partitions) is not significantly different. This trend also observed by Azari and co-workers (2000).Maskagni in 2007 reported such a trend for corn also. Therefore the number 12 treatment as the top choice between the treatments can be recommended. The effect of different treatments on percentage of sugar production in two years, performing experiments is not significant.

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