INFLUENCES OF NITROGENOUS FERTILIZER FORMS AND AMOUNTS ON YIELD AND SOME TRAITS OF SUNFLOWER

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Abstract

All the possible combination of experimental variables, four different forms of nitrogen (ammonium nitrate, a. sulphate, CAN and urea) at four different level (0, 50, 100, 150 kg N per ha), have been inspected during 3 years field trials (1993, 1994 and 1995). The cultivar C-207 has been used in the field test. The field experiments have been layout in a split plot design in randomized plot testing fertilizer forms in the main plots and nitrogen levels in sub-plots.

Increasing nitrogen up to 50 or 100 kg/ha has increased the seed weight, seed yield, and oil yield subsequently but decreased the seed oil. Fertilizer sorts did not exert significantly any of these traits. And also seed protein has not been affected either by forms or levels of nitrogen.

Key words: *Nitrogen sources, ammonium nitrate, a. sulphate, calcium ammonium nitrate, urea.*

Introduction

To obtain high yield sunflower depends on optimum fertilization in addition to cultivars and agronomic treatments. The nitrogen, among all nutrients, is the most inquired one and its remarkable effect on yields is high. In the case of nitrogen deficiency, the yield decrease; when given at high doses, the expenses is increased and the profit decreases. Because of insufficient water in the soil its effect of following crop, probably, is low, as well. Therefore, the fertilization at optimum point from the point of relationship between products and input is very important on sunflower, as in other crops. In this meaning, while suggest a fertilization amount; the cultivar on plant and the nutrition element amount existed in soil must be considered. From the nitrogen which is necessary for the optimum production of crop, its amount in soil is dropped and the difference between them is added to the soil as fertilizer. The amount of nitrogen in soil shows a variation depending on conditions. In fact that the reaplication of fertilization treatments reveals an importance. As the amount of nitrogen fertilizer exhausted by sunflower plants is concerned with the amount of nitrogen had been existed soil and uptakable capacity of plant roots in time. The nitrogen amount presented by soil to the plant is a variant concerning the applicable fertilization form under the circumstances of complex condition provided. It has been offered a lot of forms of nitrogenous fertilizers, in markets. And also, the nitrogen price per unit is changed depends on the different forms of fertilizer. If the

effects on the yield and quality of sunflower of fertilizer form is not remarkable, in this case, the most economic fertilizer form, must be preferred.

Material and Methods

Field trials have been conducted out under the rainfed condition in northern Turkey, at research station of Bafra Rural Affairs Board in Samsun for three years (1993, 1994 and 1995) with C-207, hybrid cultivar of sunflower. All the possible combination of experimental variables "four different sources of nitrogen as of ammonium nitrate (N 33%), ammonium sulphate (N 21%), calcium ammonium nitrate (CAN, N 26 %) and urea (N 46 %) and four different level of N per hectare, as of 0, 50, 100 or 150 kg" were tested. To enable the balanced feeding of the plants, triple super phosphate, uniformly as of 100 kg P2O5 per ha was used to the area of nurseries. The potassium was not applied because of existing in soil. The field experiments have been layout in a split plot design in randomized plot, with tree replication, testing fertilizer forms in main plots and fertilizer levels in the sub plots.

The soils of experimental area were found clay-loam in texture, poor in organic matter and phosphorus (2.6% and 37.6 kg/ha, respectively) and rich in potassium (826.9 kg/ha) and also slightly alkaline (pH=7.0-7.5) the main value of precipitation and temperature were observed as of 617.7 mm and 12.5 °C according to the long-term observations (1).

Sowing of the seeds was done at the third week of may and the plants were harvested in October. Furrow irrigations during 1993 and 1994, were performed as required (2 or 3 times for, each season), but only once in 1995 (because of limiting factors). However, digging and other agronomic applications were enabled as needed.

Seed yield and 1000-seed weight is calibrated by 11% of moisture based. All data subjected to analyses of variance given as of the calibrated data. The data belonging to oil and protein contents were calculated in based of dry matter. The data of seed yield analysing by regression equation was formulated with the second levels of the relationship between nitrogen doses and seed yield; as well, the peak doses were examined to enable yield maximum (2).

Utilising from the crop, nitrogen prices, the most economic dose of fertilization were obtained (3).

Results and Conclusion

The data for 3 years belonging to the effects of the different level and form of nitrogen fertilization on yield and some characters of sunflower is given in Table 1. As seen in the table, the seed yield handled, both 1993 and 1994, has higher score than handled in

1995 production. Decreasing seed yield is due to insufficient irrigation in 1995 most likely.

Differences between the years in terms of the yield has been seen highly significant.

Table 1. The effect of different nitrogen sources and doses on the seeds yield and some characters of sunflower(1)

Treatments	Seed yield (kg/ha)	Oil contents (%)	Oil yields (kg/ha)	seed weight g/1000 seed	Protein cont.(2) (%)
Years					
1993	2978 b	38.92 b	1150 b	57.3 b	16.75 b
1994	3289 a	39.73 b	1302 a	69.9 a	18.25 a
1995	1897 c	41.75 a	792 c	54.1 c	14.94 c
Diff.	*S***	*S***	*S***	*S***	*S***
Sources of Nitrogen					
Ammonium sulphate	2877	40.26	1144	60.6	16.75
Calcium-Ammonium nitrate	2578	40.02	1023	59.5	15.56
Ammonium nitrate	2722	39.86	1075	61.8	16.25
Urea	2707	40.39	1084	60.0	16.94
Diff.	*NS*	*NS*	*NS*	*NS*	*NS*
Doses of Nitrogen (kg N/ha)					
0	2059 c	41.55 a	859 c	58.4 b	16.38
50	2612 b	39.80 b	1027 b	61.0 a	16.50
100	3027 a	39.41 b	1188 a	60.1 ab	16.94
150	3186 a	39.76 b	1252 a	62.4 a	16.69
Diff.	*S***	*S**	*S***	*S**	*NS*
CV (%)	17.56	7.54	19.99	8.38	8.00

(1) Non significant differences between means which shown by same characters
(2) Multiplying N value by 6.25
S* , S** Significant at P<0.05 and P<0.01 levels, respectively.

Though the seed yield varies from 2877 to 2578 kg per ha as used ammonium sulphate and calcium ammonium nitrate respectively, the nitrogen source did not exert significant effect on yield.

Seed yield has been increased as increasing the nitrogen amount (Figure 1). Although not given any nitrogen, the yield was of 2059 kg per ha, when applied 150 kg

nitrogen per ha, the yield became 3186 kg per ha (Table 1). There has been observed significantly differences between the nitrogen levels in terms of seed yield. An increment by 55 per cent on yield as applying N 150 kg per ha revealed that the experimental soil needs nitrogen for high yield. The effect of nitrogen doses on kernel yield was provided linear and quadratic meaning. An $Y= 2050.3 + 13.2528x - 0.03749x^2$ quadratic regression equation showed the relationship between nitrogen levels and seed yield. This equation obtain the relationship between the convenient nitrogen and yield at the experimental area as in Figure 2. Concerning this figure, the maximum yield would be obtain by applying N as of 176.75 kg per ha.

On the other hand, using more fertilizer, it means costly production. So, applying more fertilizer to produce high yield, meanwhile one must to keep inputs under control. Furthermore, we have to find out that to the point at which fertilization still rantable. Fact that, the increment of yield per N unit at a level of 50 kg/ha has been fulfiled higher than 150 kg N/ha. Thus, optimum amount of nitrogen from the point of yield and fertilization relations was calculated as of 90 kg N per hectare.

In spite of relatively higher seed yield at the third year of investigation, there is no significant difference between the years in regarding to the oil content. Different kind of nitrogenous fertilizer did not affect the seed oil significantly. On the other hand, the oil content of seed has been decreased as the nitrogen applied increased ($P<0.05$). Even though obtained high oil rate from the control parcels(N nile), that means more nitrogen less oil, except 150 kg N per ha (Figure 3).

In 1994, high yield and high seed oil resulted in high oil yield per ha. The effect on oil yield of nitrogen forms found to be not significant. However, the oil yield was affected by nitrogen amount significantly (Table 1, Figure 4). A stable increase has been observed between N levels and oil yield (Figure 5) and the maximum value of oil yield obtained by given 150 kg N per ha, as 45.8 per cent more than controls. It has been stated a quadratic effect between the nitrogen level and oil yield that means an equation $Y=851.529 + 4.8389x - 0.01709x^2$. Regarding this formula, the maximum oil yield has been provided applying 141.57 kg of nitrogen per ha (Figure 5).

The seed weight showed a significant difference relating to years. Lower seed weight has been realized, as seed yield, in 1995. Of course, the effect of poor irrigation would be a cause either producing small seed or seed weight. As mentioned previously, 1000-seed weight has not been affected by different forms of nitrogen. A linear increase has been observed between nitrogen levels and 1000 seed weight (Table 1, Figure 6)

The protein content of seeds appeared significant difference in relating to the years . The lowest value of seed protein was obtained in 1995 as of 14.94 per cent in which, the

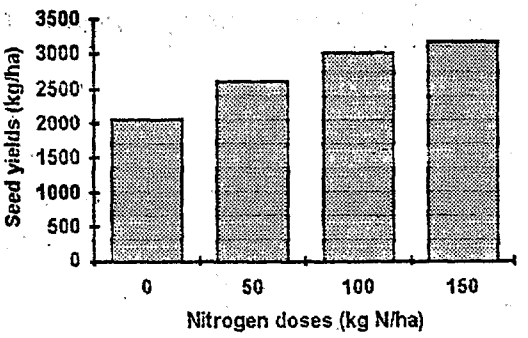

Figure 1. Relationship between nitrogen levels and seed yields

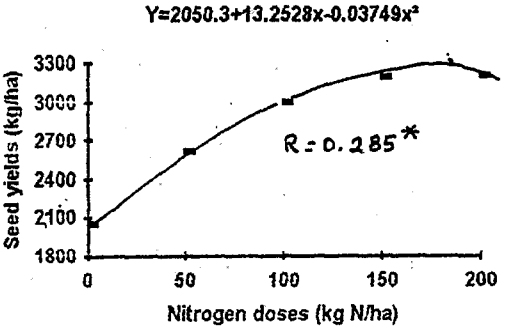

Figure 2. Expected seed yields by equation of regression

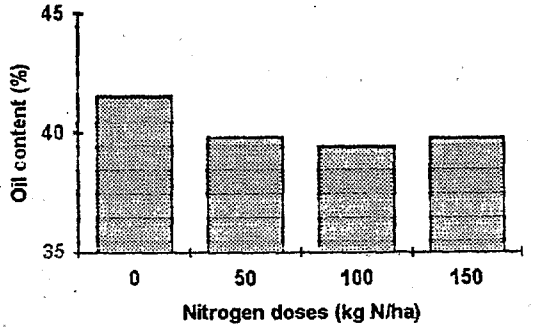

Figure 3. Relationship between nitrogen levels and oil contents

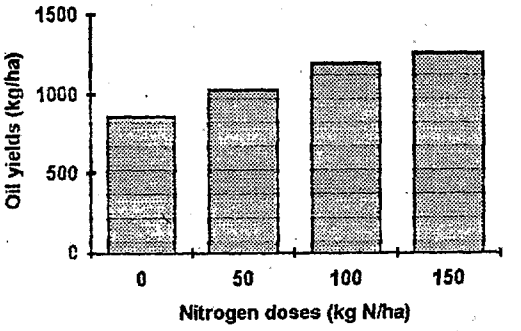

Figure 4. Relationship between nitrogen levels and oil yields

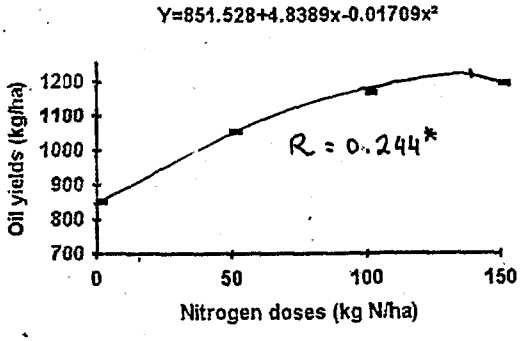

Figure 5. Expected oil yields by equation of regression

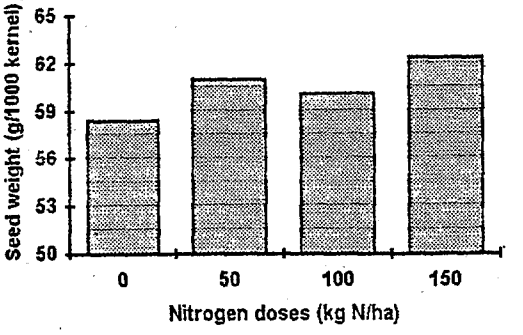

Figure 6. Relationship between nitrogen levels and 1000-seed weight

highest value of seed oil was handled. Either nitrogen forms or nitrogen doses did not exert significantly seed protein content.

It is summarized, that the seed yield, oil yield and seed weight have been increased as increasing nitrogen level but oil content decreased. But all these traits have not been affected by different kinds of nitrogenous fertilizers. Also seed protein has not been affected either by nitrogen sources or nitrogen levels. As the result, 90 kg of N per hectare would be recommend in the form of urea which is chipper in the comparison to others, since it does not make big difference for the seed yield and quality.

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