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The Effects of Different Irrigation Levels and Nitrogen Rates on Peanut Yield and Quality in Southeastern Anatolia Region of Turkey

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ABSTRACT
The aim of research about irrigation and nutrition of peanut is to determine most suitable irrigation level and nitrogen fertilizer dose for peanut in the Harran conditions (Şanlıurfa, Turkey).In this study, different amounts of the nitrogen (N_1:0, N_2:40, N_3:80, and N_4:120 kg N ha^{-1}) were applied as ammonium nitrate in two times as planting and flowering times to peanut plants. The irrigation levels were determined as 100, 75, 50, and 25% of the irrigation required and labeled as I_1 (first irrigation), I_2 (second irrigation), I_3 (third irrigation), and I_4 (fourth irrigation), respectively. In this study, positive and significant effect were found that the need protein and the increasing of peanut yield with its components were increased with 120 kg ha^{-1} nitrogen fertilization (N_4) and no-deficit water (100%:I_1) while the variable 100 fruit weight were increased with 80 kg ha^{-1} nitrogen fertilization (N_3) and no-deficit water (100%:I_1) application on plant. The plant height and 100 seed weight except 2nd year were also increased with 80 kg ha^{-1} nitrogen (N_3) and no-deficit water (100%:I_1).

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Güneydoğu Anadolu Bölgesi Şartlarında Farklı Sulama Düzeyleri ve Azot Oranlarının Yerfıstığı Verimi ve Kalitesi Üzerine Etkisi

ÖZET
Bu çalışma ile Harran koşullarında (Şanlıurfa, Türkiye) yerfıstığı için en uygun sulama seviyesini ve azotlu gübre dozunu belirlemek amaçlanmıştır. Azotlu gübre uygulamaları (N_1: 0, N_2: 40, N_3: 80 ve N_4: 120 kg N ha^{-1}) amonyum nitrat olarak, ekimden sonra % 50'si, diğeri çiçeklenmede) uygulanmıştır. Sulama seviyeleri; sırasıyla gerekli sulama seviyesinin % 100'ü (I_1), % 75'i (I_2), % 50'si (I_3) ve % 25'i (I_4) olarak belirlenmiştir. Bu çalışmada, uygulamalara bağlı olarak protein ve yerfıstığı veriminin 120 kg N ha^{-1} azot gübrelemesi (N4) ve % 100 (I_1) sulama uygulaması ile arttığı bulunmuştur. En fazla bitki meyve ağırlığı 80 kg N ha^{-1} azot gübreleme (N_3) ve % 100 sulama uygulaması ile elde edilmiştir. Yine en yüksek bitki boyu (2. yıl hariç) ve en fazla 100 tohum ağırlığı da yine 80 kg N ha^{-1} azot (N_3) ve % 100 sulama uygulaması ile tespit edilmiştir.

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INTRODUCTION
In the world, peanut (*Arachis hypogaea* L.) is an important summer oil and food grain legume, and it contains fiber (approximately 5%), carbohydrate (20%), protein (25-30%), oil (50%) and ash for human food (Arıoğlu et al., 2016). Peanut is grown in semiarid and arid regions and needed irrigation to produce for more yields. Plant yields are controlled by environment conditions. Peanut plants are most sensitive to water stress in the flowering time and pod filling like other plants. Adequate irrigation and soil moisture in the plant production are critical factors for formation of peanut pods (Reddy et al., 2003).

Trostle (2004 and 2005) found that the legume

response to N fertilization is inconsistent. The response of peanut to N fertilizer has been attributed to differences in environmental and edaphic conditions (Reddy et al., 2003; Lanier et al., 2005). Nitrogen element is an important and critical nutrient for developing and producing of plant (Erisman et al. 2010). Nitrogen is also present in the plant metabolisms as amino acids in the functional proteins positively affects the content of protein and increases the scope of amino acids (Kasap et al., 1999; Rowland et al., 2012; Arıoğlu et al., 2016).

Some studies (Sun et al., 2010; Chen et al., 2015) have shown that fixation of N in the nodules could occur only 40 to 50% of nitrogen needed by peanut growth. This condition has indicated that more than half of the N requirement by peanuts has been taken up from soil and fertilizer. It was reported by Kandil et al. (2007) that the rising to 40 kg/ha nitrogen level increased some plant characteristics such as leaves numbers, pods, stems, and its dry weight per plant. It was also determined by Ali and Seyyed (2010) and Ali and Ebrahim (2011) underlined that use of N fertilizer resulted in the increasing of the kernel and pod yield. Wen et al. (2001) reported that the maximum recommendable amount of nitrogen was 120 kg N ha^{-1} for the sandy soil condition in Japan.

Barbieri et al. (2017) designed an experiment that 4 evapotranspiration levels (30, 70, 110 and 150%, ET_0) and different nitrogen doses (0, 30, 60, 90 and 120 kg/ha) were studied with two peanut varieties in Brazil. Irrigation stages were 110% of ET_0. In the 150% of ET_0 application showed higher husk yield, and lower grain yield. Hu et al. (2018) conducted the experiment that they used peanut with different N treatments (N_0: 0 kg, N_1: 40 kg, N_2: 60 kg and N_3: 80 kg) and irrigation managements (W_0: the rain-fed circumstance and W_1: the supplemental irrigation based on the soil moisture with lower limit of soil water of 55% of field capacity, FC) in China. The yield of peanut increased with rising nitrogen application except decreasing at N_3 application. N levels, irrigation managements and their interactions affected significantly on the peanut yield. Researchers also stated that the highest yield had in the W_1N_2 treatment.

In this study, the response of peanut, in its various doses of nitrogen fertilizations with different irrigation levels on growth has been studied in Şanlıurfa agricultural conditions, Turkey. Irrigation methods and the quantities of water needs were applied to determine the some growth and yield characteristics of *Arachis hypogaea* L., NC7 var.).

MATERIAL and METHODS

Study Area Conditions

The used soil results were generally given as follows: moderately alkaline (pH:7.5), clayey, highly lime and low organic matter content. Field capacity (FC) of soils was 32.71-33.84%, permanent wilting point was 21.18-22.55% and bulk density between 1.37 and 1.41 g cm^{-3}. The maximum air temperature, maximum rainfall and moisture of this area were 43.3 °C (in July), 93.1 mm (in January) and 71% (in January) respectively. In this study, peanut (*Arachis hypogaea* L., NC-7 var.) was grown two years (in 2004 and 2005 years from June to October). The meteorological data of this area are presented belonging to the season of peanuts planted in Table 1.

Table 1. Meteorological data in Sanliurfa.
Çizelge 1. Şanlıurfa'nın meteorolojik verileri.

Year *(Yıl)*	Month *(Ay)*	June *(Haziran)*	July *(Temmuz)*	August *(Ağustos)*	September *(Eylül)*	October *(Ekim)*
2004	Av. temperature, °C *(Ortalama sıcaklık, °C)*	29.0	32.8	30.8	27.3	21.7
	Max.temperature, °C *(Maksimum sıcaklık, °C)*	39.4	43.3	43.1	38.5	35.0
	Min. temperature, °C *(Mniumum sıcaklık, °C)*	17.3	21.1	20.0	16.4	11.3
	Relative humidity, % *(Nem, %)*	33.5	27.0	40.7	34.8	35.2
	Total rainfall, mm *(Toplam yağış, mm)*	0	0	0	0	
2005	Av. temperature, °C *(Ortalama sıcaklık, °C)*	27.4	33.0	32.1	26.3	18.6
	Max. temperature, °C *(Maksimum sıcaklık, °C)*	38.5	43.7	43.5	37.2	32.0
	Min. temperature, °C *(Mniumum sıcaklık, °C)*	15.1	20.4	20.0	16.0	6.8
	Relative humidity, % *(Nem, %)*	35.9	32.8	44.7	46.0	52.9
	Total rainfall, mm *(Toplam yağış, mm)*	31.3	0	2.3	0	17.4

The experiment was set up in the Harran University Research Field Area, Turkey located at 37o07'23" N and 38o49'02" E. The altitude of the study area is 467 m.

Experimental Design

In the experiment, peanut selected as NC-7 variety was grown from May 14 to September 10 in 2004 and from May 17 to September 14 in 2005. The study was carried out to determine the effects of different amounts of nitrogen (N_1:0, N_2:40, N_3:80, and N_4:120 kg N ha^{-1} on the peanut yield and other parameters. The nitrogen fertilizer source was ammonium nitrate (26% N) and the nitrogen of 50% during was applied the planting time the other 50% of it was applied at the flowering stage. The plots were fertilized with 60 kg P_2O_5 ha^{-1} as phosphorus fertilizer as TSP with planting. The seeds were sown with 20 cm row spacing and 5 cm rows. The row spacing was 70 cm in 4 row-

plots. The experiment was designed as split-plots which main plot is nitrogen with three replicates. Irrigation levels were calculated with class A evaporation pan which measured the volume of evaporating water. Irrigation levels (I) were planned as 100%, 75%, 50%, and 25% of the required irrigation methods (represented with I_1:first, I_2:second, I_3:third, and I_4:fourth, respectively) to determine most suitable irrigation level for peanut in the Harran conditions. The sprinklers were lined 6 m apart from each other and flow rate was 3 atm pressures. Irrigation level was 100% at the closest line to the sprinklers, and followed by 75%, 50%, and 25%, respectively. The pesticides were not used in the experiment. It was performed until the plants covered inter rows by hoeing.

Statistical Analysis

The statistical analyses of data were carried out using Statistical Analysis System, JMP. The significant differences were founded by using the Least Significant Difference (LSD) multiple range test at $p<0.05$.

RESULTS and DISCUSSION

Agronomic Characteristics of Peanut Plant

The data of the treatment on the some yield components of peanut as brunch number, fruit weight and seed weight is shown in Table 2.

In this study, water deficits reduced the plant height of peanuts leaves, brunch number in per plant, 100 fruit weight and 100 seed weight. The effect of nitrogen applications as N_3 (1st year) and N_2 (2nd year) on the plant height increased. The brunch number of plants also increased with nitrogen applications as N4 (1st year) and with nitrogen application and irrigation 2 method, N_4+I_2 (2nd year). The 100 fruit numbers of plants also increased with nitrogen applications as N_3 (1st year and 2nd year) in the study (Table 2).

Statistically, deficit irrigation significantly affected some agronomic characteristics of peanut. The some yield components of the plant are statistically significant between full irrigation (I_1) and deficit irrigation treatments (I_2, I_3, and I_4). The plant height of peanut was reduced by in I_2, I_3, and I_4 with comparing full irrigation (I_1). N-fertilization of 80 kg N ha^{-1} in first year and 40 kg N ha^{-1} in second year were more effective in increasing of the plant height. The brunch numbers of plants were generally reduced by application of the deficit irrigation level in two years. Nitrogen fertilization of 120 kg N ha^{-1} in two years was founded more effective in increasing of the plant brunch number with the highest plant brunch number was determined at I_2 application in the second year. The 100 fruit weight and 100 seed weight of the plants were also reduced by application of the deficit irrigation in two years. 80 kg N ha^{-1} in two years was determined that it is effective in increasing of the 100 fruit weight. 80 kg N ha^{-1} was determined that it is effective with I_2 irrigation level in first year and with I_1 irrigation level in second year.

The vegetative growth of peanut and its components were sensitive to water stress (Reddy and Reddy, 1993; Reddy et al. 2003). Nitrogen also most important element to develop for plants (Erisman et al. 2010). Jana et al. (1990) stated that 40 kg N ha^{-1} produced a pod yield. Kandil et al. (2007) founded that the nitrogen level was increased stems, leaves number, total pods, and pod dry weight in per plant. Barbieri et al. (2017) stated that the treatments of ET_0 as 30% and 70% of the allowed more growth as height, but small productivity. Chung et al. (1997) found that water deficits reduce the number of leaves per plant, leaf areas and leaf weight. Findings are in agreement with the these researchers.

Yields of Peanut

Deficit water application on peanut (NC7) were generally reduced the peanut yield (as g $plant^{-1}$ and kg ha^{-1}) and seed percent in this study. Nitrogen application (at I_2N_4 application in 1st year and I_1N_4 application in 2nd year) with deficit water application on peanut (NC7) increased the yield (g $plant^{-1}$). In general yield (kg ha^{-1}), nitrogen application (at I_1N_4 in 1st year and at I_1N_3 in 2nd year) with deficit water application on peanut (NC7) were increased this study. Nitrogen application (at I_2N_2, I_2N_3, N_4I_2 and I_3 N_4 applications in 1st year and I_1N_2, I_1N_3 and I_1N_4 applications in 2nd year) with deficit water application on peanut (NC7) were found highest increased the seed percent (%) (Table 3).

Protein and Oil Levels of Peanut

Peanut (*Arachis hypogaea* L.) is an oil seed crop and contain over 50% oil and 25% protein. Nitrogen is most important for level of amino acids and proteins. Also, nitrogen is the element that is more taken with plants. It is also fundamental element for the photosynthetic process (Erisman et al., 2010; Rowland et al., 2012; Neto et al., 2012: Arıoğlu et al., 2016).

Decreasing of irrigation levels with increasing nitrogen applications have significantly affected and increased to the protein ratio of peanut seeds in both years (Table 4). The effect of deficit irrigation applications and nitrogen fertilizing was found different effect on oil contents of peanut seeds in both years in which as the oil content was in the same group statistically no-nitrogen application with 100% irrigation method. Therefore, a lot of application on the oil content of peanut seed was found statistically in the same group (as: N_1-I_1, N_2-I_2, N_3-I_1, N_3-I_2 and N_4-I_2 in 1st year and N_1-I_1, N_1-I_2, N_1-I_3, N_2-I_1, N_2-I_2, N_2-I_3, N_2-I_4, N_3-I_1, N_4-I_1, N_4-I_2 and N_4-I_4 in 2nd year).

Table 2. Means of some agronomic traits on peanut in 2004 and 2005.
Çizelge 2. Yerfıstığında 2004-2005 yıllarındaki bazı tarımsal özelliklerin ortalamaları

	1st year *(1. yıl)*					2nd year *(2. yıl)*				
Plant height, cm *(Bitki boyu, cm)*										
	N_1	N_2	N_3	N_4	Mean *(Ort.)*	N_1	N_2	N_3	N_4	Mean *(Ort.)*
I_1	23.30 ±0.53d	27.30 ±0.29b	29.37 ±0.59 a	22.53±0.56 de	25.63 ±0.88	28.43 ±1.15 bc	32.50 ±0.80 a	31.10 ±1.76 ab	30.90 ±1.47 ab	30.73 ±0.72
I_2	16.27 ±0.46g	21.53 ±0.38e	25.80 ±0.17 c	16.93±0.15 fc	20.13 ±1.17	21.33 ±1.04 d	26.83 ±0.73 c	29.30 ±0.35 bc	21.06 ±0.55 d	24.63 ±1.11
I_3	13.20 ±0.70h	17.67 ±0.56f	16.57 ±0.46 fg	15.97±0.58 g	15.85 ±0.56	16.67 ±1.21 ef	19.23 ±1.01 de	20.30 ±0.82 d	19.87 ±1.37 d	19.02 ±0.64
I_4	8.03 ±0.62k	10.20 ±0.27j	11.40 ±0.63 ıj	11.80 ±0.40 ı	10.36 ±0.49	10.13 ±0.69 h	12.97 ±0.35 gh	13.20 ±1.13 g	15.13 ±0.90 fg	12.86 ±0.64
Mean*(Ort..)*	15.20 ±1.68	19.18 ±1.88	20.78 ±2.17	16.81 ±1.17		19.14 ±2.06	22.88 ±2.26	23.47 ±2.23	21.74 ±1.80	
LSD,5%	0.67					1.51				
CV (%)	4.46					8.29				
Brunch number, per plant *(Bitkideki Dal sayısı)*										
I_1	7.20 ±0.06 b	7.10 ±0.12 b-d	7.00 ±0.06 b-e	7.83 ±0.12 a	7.28 ±0.11	5.50 ±0.06 e	5.53 ±0.09 e	5.93 ±0.13 c	5.83 ±0.09 cd	5.70 ±0.07
I_2	7.20 ±0.06 b	6.97 ±0.12 c-e	6.80 ±0.06 e	6.90 ±0.06 de	6.97 ±0.06	4.80 ±0.06 gh	4.93 ±0.09 fg	5.93 ±0.09 c	6.93 ±0.07 a	5.65 ±0.26
I_3	7.00±0.06be	7.03 ±0.03 b-d	7.06 ±0.09 b-d	6.93 ±0.09 c-e	7.00 ±0.03	4.63 ±0.03 h	5.20 ±0.06 f	5.97 ±0.09 c	6.67 ±0.17 ab	5.62 ±0.24
I_4	6.90 ±0.06 de	7.13 ±0.09 bc	6.90 ±0.06 de	7.13 ±0.03 bc	7.02 ±0.04	4.80 ±0.06 gh	4.13 ±0.12 ı	5.60 ±0.06 de	6.63 ±0.09 b	5.29 ±0.28
Mean *(Ort.)*	7.08 ±0.05	7.06 ±0.05	6.94 ±0.04	7.20 ±0.12		4.93 ±0.10	4.95 ±0.16	5.86 ±0.06	6.51 ±0.13	
LSD 5%	0.11					0.13				
CV (%)	1.80					2.89				
100 Fruit weight, g *(100 meyve ağırlığı, g)*										
I_1	159.37±4.90b	156.03 ±2.58 b	170.47 ±2.83 a	165.93 ±2.09 a	162.95 ±2.20	187.17±8.33 ac	180.23±3.94 bc	195.67 ±3.04 a	191.67±7.50ab	188.68 ±3.13
I_2	109.30±0.59 e	130.10 ±1.46 c	130.50 ±2.92 c	156.83 ±1.36 b	131.68 ±5.16	129.43 ±4.96 f	157.30 ±0.90 d	154.77±2.26 de	176.53 ±2.83c	154.51 ±5.22
I_3	105.23±1.56 e	119.67 ±0.99 d	119.47 ±2.11 d	129.80 ±3.65 c	118.54 ±2.81	114.13±7.43 gh	150.57±3.18 de	143.77 ±1.74 e	161.00±1.95de	142.37 ±5.56
I_4	88.53±1.83 gh	92.57 ±0.46 fg	95.40 ±2.66 f	82.60 ±1.38 h	89.78 ±1.63	102.77 ±4.02 hı	119.77 ±1.28 fg	116.93 ±1.55 g	98.60 ±4.07ı	109.52 ±3.01
Mean*(Ort.)*	115.61±8.06	124.59 ±6.89	128.96 ±8.25	133.79 ±9.83		133.38 ±10.17	151.97 ±6.61	152.78 ±8.59	156.95 ±10.85	
LSD,5%	3.12					6.24				
CV (%)	2.97					5.02				
100 Seed weight, g *(100 tohum ağırlığı, g)*										
I_1	76.08 ±2.46bc	64.84 ±4.65 de	79.38 ±2.24 ab	64.67 ±3.26d-f	71.24 ±2.43	77.33 ±4.78 b	75.83 ±0.91 bc	73.63 ±3.82 b-d	88.80 ±1.54 a	78.90 ±2.23
I_2	62.77 ±3.36e-g	69.87 ±2.95 c-e	67.78 ±2.07 de	85.16 ±2.26 a	71.39 ±2.77	76.17 ±1.68 bc	71.80 ±1.62 b-e	70.77 ±3.22 c-e	76.33 ±0.44 bc	73.77 ±1.14
I_3	65.96 ±0.21 de	50.69 ±1.58 h	66.87 ±2.11 de	71.90 ±1.94 cd	63.85 ±2.49	51.03 ±3.93 ı	61.10 ±1.44 fg	68.80 ±2.17 de	57.63 ±1.22 gh	59.64 ±2.19
I_4	57.51 ±0.70 f-h	51.37 ±0.17 h	56.38 ±1.06 gh	56.91 ±3.50 gh	55.54 ±1.08	57.53 ±1.52 gh	51.60 ±2.65 hı	66.03 ±1.71 ef	53.70 ±1.55 hı	57.21 ±1.85
Mean *(Ort.)*	65.58 ±2.23	59.19 ±2.80	67.61 ±2.59	69.66 ±3.36		65.52 ±3.73	65.08 ±2.95	69.81 ±1.48	69.12 ±4.32	
LSD,5%	3.64					3.09				
CV (%)	6.67					5.49				

Table 3. Means of peanut yields, yield per plant and seed percentage.
Çizelge 3. Yerfıstığı verim, bitkibaşına verim ve iç oranı ortalamaları.

Yield per plant, g *(Bitki başına verin, g)*										
	1st year					2nd year				
	N_1	N_2	N_3	N_4	Mean (Ort.)	N_1	N_2	N_3	N_4	Mean *(Ort.)*
I_1	50.00 ±1.01 d	59.87 ±3.48 c	62.13 ±0.88 bc	64.37 ±2.26 b	59.09 ±1.90	91.80 ±0.98 d	95.70±2.52 cd	104.20 ±2.23b	116.20±3.71 a	101.98 ±3.02
I_2	46.47 ±2.84 de	44.10 ±2.46 e	45.67 ±1.63 de	72.83 ±1.36 a	52.27 ±3.71	69.30 ±0.51 ef	72.87±1.16 e	100.47±4.28bc	99.80±3.38 bc	85.61 ±4.56
I_3	21.27±0.38 gh	35.37 ±1.10 f	38.73 ±1.07 f	39.33 ±1.87 f	33.68 ±2.27	46.37±3.48 gh	42.20±1.46 h	52.33 ±2.81g	64.36±1.71 f	51.32 ±2.74
I_4	16.17 ±0.74 ı	21.93 ±1.25 g	18.83 ±1.09 g-ı	17.17±1.09hı	18.53 ±0.80	24.60 ±0.90 k	31.63±0.41 ıj	28.50±0.42jk	34.53±0.43 ı	29.81 ±1.14
Mean*(Ort.)*	33.48 ±4.55	40.32 ±4.27	41.34 ±4.71	48.43 ±6.63		58.02 ±7.61	60.60±7.66	71.38 ±9.76	78.73 ±9.61	
LSD,5%	2.20					3.00				
CV (%)	6.46					5.36				
Yield, kg da^{-1} *(Verim, kg da^{-1})*										
I_1	410.89±14.61 f	477.75±6.66 bc	495.66±8.25 b	527.68±8.13 a	477.99±13.54	556.11±10.45d	645.57 ±20.19c	762.63±19.88a	708.28 ±8.60 b	668.15±24.11
I_2	444.12±9.05 e	356.80±11.45 g	452.83±6.46 de	469.01±9.58cd	430.69±13.73	482.43±9.39e	551.09 ±10.23d	664.85±5.15c	559.59±18.53 d	564.49±20.30
I_3	240.32±2.77 ı	274.85±6.70 h	281.82±9.48 h	337.55±11.72g	283.64±11.10	360.66±8.06f	370.40 ±8.77f	466.62±6.98e	482.72 ±12.76 e	420.10±17.05
I_4	124.24±4.60 m	151.43±5.60 l	176.27±5.66 k	208.80±6.60 j	165.19±9.71	214.78±7.42g	227.83 ±9.38 g	242.28±6.67g	235.37 ±4.63 g	230.07±4.35
Mean*(Ort.)*	304.89±39.33	315.21±36.03	351.65±39.04	385.76±37.35		403.49±39.20	448.72 ±48.97	534.10±60.31	496.49 ±51.88	
LSD,5%	10.80					16.29				
CV (%)	3.82					4.14				
Seed percent, % *(Tohum yüzdesi, %)*										
I_1	55.19±1.61ef	57.40 ±1.83 c-e	57.29 ±2.11 c-e	58.55±2.73b-e	57.11 ±0.97	51.70 ±0.84 ef	62.33 ±0.84 a	60.37 ±1.27 ab	62.10 ±0.78 a	59.13 ±1.37
I_2	58.57±0.28be	62.07 ±1.82 ab	61.54 ±1.81 a-c	61.34±1.91a-c	60.89 ±0.80	49.03 ±0.22 f	52.23 ±1.33 d-f	52.30 ±0.67 def	58.17 ±1.26 a-c	52.93 ±1.08
I_3	56.65±2.42df	60.47 ±2.09 a-d	59.33 ±1.82 a-e	63.66±1.23a	60.03 ±1.12	40.77 ±2.27 gh	55.97 ±1.30 c-e	51.47 ±1.45 f	56.43 ±2.59 b-d	51.16 ±2.08
I_4	56.32±1.27df	52.51 ±1.67 f	59.89 ±1.35 a-d	60.90±1.64a-d	57.41 ±1.18	42.73 ±1.39 g	37.53 ±1.85 h	52.70 ±1.78 def	48.67 ±2.34 f	45.41 ±1.91
Mean(*Orta)*	56.68±0.77	58.12 ±1.35	59.51 ±0.89	61.12±1.00		46.06 ±1.47	52.02 ±2.81	54.21 ±1.22	56.34 ±1.68	
LSD,5%	2.32					2.14				
CV.%	4.72					4.91				

Table 4. Means of protein and oil content of peanut.
Çizelge 4. Yerfıstığı yağ ve protein içeriği ortalamaları.

Protein, % *(Protein, %)*										
	1st year					2nd year				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean *(Ort.)*
I_1	22.22 ±0.15 e	24.61 ±1.04 cd	25.76 ±0.13 c	25.85 ±0.16 c	24.61 ±0.50	22.11 ±0.81 g	24.74 ±0.27 def	26.55 ±0.58 b-d	25.43 ±0.51 c-f	24.71 ±0.55
I_2	23.45 ±0.32 de	25.18 ±0.79 cd	25.54 ±0.22 c	25.23 ±0.88 cd	24.85 ±0.36	24.15 ±0.94 f	26.26 ±0.31 b-d	26.84 ±0.86 bc	26.66 ±0.66 bc	25.98 ±0.45
I_3	22.68 ±0.89 e	26.04 ±0.37 c	26.42 ±0.27 bc	27.86 ±1.27 ab	25.75 ±0.67	24.42 ±0.95 ef	27.23 ±0.56 a-c	27.32 ±0.13 ab	27.00 ±0.23 bc	26.49 ±0.44
I_4	22.49 ±0.50 e	25.37 ±0.53 c	25.10 ±0.35 cd	28.29 ±0.98 a	25.31 ±0.68	26.02 ±0.88 b-e	27.11 ±0.54 bc	28.97 ±0.45 a	29.01 ±0.43 a	27.78 ±0.46
Mean *(Ort.)*	22.71 ±0.27	25.30 ±0.35	25.71 ±0.18	26.81 ±0.55		24.18 ±0.57	26.34 ±0.35	27.42 ±0.37	27.03 ±0.44	
LSD,5%	0.91					0.92				
CV (%)	4.34					4.19				
Oil, % *(Yağ, %)*										
I_1	61.84 ±2.02 a	54.35 ±2.20 d-f	59.29 ±1.97 a-c	54.71 ±1.42 c-f	57.55 ±1.26	51.71 ±1.67 a-d	53.02 ±1.93 a-c	54.53 ±1.53 ab	54.97 ±1.96 a	53.56 ±0.85
I_2	52.73 ±1.31 ef	57.32 ±1.60 a-e	58.04 ±1.82 a-c	60.26 ±0.50 ab	57.09 ±1.02	53.41 ±2.07 a-c	53.71 ±2.33 a-c	48.09 ±1.67 d	53.33 ±1.13 a-c	52.14 ±1.06
I_3	52.51 ±1.18 ef	51.85 ±0.32 f	51.66 ±1.92 f	53.09 ±2.40 ef	52.28 ±0.73	53.70 ±1.01 a-c	52.93 ±1.97 a-c	50.42 ±1.36 cd	50.19 ±1.73 cd	51.81 ±0.81
I_4	53.06 ±2.16 ef	52.73 ±0.30 ef	55.43 ±1.65 b-f	52.01 ±1.99 f	53.30 ±0.82	42.94 ±0.93 e	51.33 ±1.79 a-d	50.85 ±1.36 b-d	51.25 ±1.37 a-d	49.09 ±1.23
Mean *(Ort.)*	55.04 ±1.40	54.06 ±0.86	56.11 ±1.18	55.02 ±1.21		50.44 ±1.47	52.75 ±0.90	50.98 ±0.94	52.43 ±0.88	
LSD,5%	3.81					1.99				
CV (%)	5.29					4.61				

Reddy et al. (2003) implied that peanut is important legume crop for the agricultural activity and its seeds highly comprise protein level (25–28%) and edible oil (43–55%). Conkerton et al. (1989) reported that drought stress early or late time in the growing season had little effect on seed oil, proteins and mineral contents in the 7 varieties of peanut tested.

DISCUSSION

Peanut was implied that it is about the production of seed and its oil has important potential in comparison to plant consist oil and protein. The peanut plant with efficiently fertilization and irrigation especially nitrogen application is effected plant growth, growth mechanisms, water using, phonological and physiological characteristics.

In this study, positive and significant effect and was found that the need protein and the increasing of peanut (*Arachis hypogeae* L.) yield with its components were increased with nitrogen fertilization (120 kg N ha^{-1}, N_4) and no-deficit water (100%:I_1) while the variable 100 fruit weight were increased with nitrogen fertilization (80 kg N ha^{-1}, N_3) and no-deficit water (100%:I_1) application on plant. The plant height and 100 seed weight except 2nd year were also increased with nitrogen fertilization (80 kg N ha^{-1}, N_3) and no-deficit water (100%:I_1) in the study.

Anzum et al. (2011) and Duarte et al. (2013) also stated to effect of water availability and deficiency on peanut growth. Nitrogen element for plants is the element most absorbed and used from soil because of being necessary in the all stages of plants. It also presents in the protein and the other synthesis of metabolites of peanut plants as implying Neto et al. (2012) and Rowland et al. (2012).

The nitrogen fertilizer recommendation for peanut growth and yield is important as balancing fertility program. The fertilizer program also effects on irrigation level and method for high yield. On the plant growth, yield and yield components (oil, protein etc.), effects of the water and nitrogen applications rise and theirs availability is critical. In this research, results have shown that nitrogen and water demand has the greatest effect on peanut yields. In addition to the above references with regarding to effect of the irrigation and fertilization on peanut, it can be implied to continue with different previous studies mentioned in introduction section of the research.

Statement of Conflict of Interest

Authors have declared no conflict of interest.

Author's Contributions

The contribution of the authors is equal.

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