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Influence of different levels of nitrogen fertilizers on some sunflower cultivars quality: A Review

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Abstract— *The effect of NF on sunflower cultivars of Flamy (FL) and Manon (MA) were tested during planting at three NF of 175, 200 and 250 kg.N.ha^{-1}. The experiments were conducted in a factorial experiment under complete randomized design with three replications. The results showed that the MA cultivar was significantly better than the FL in all studied conditions. The soil properties SBD, TSP, RL, RDFW, PDFW, SD, Sl, PVI and GY were; 1.29mg.cm^{-3} ,1.30 mg.cm^{-3},1.33 mg.cm^{-3}, 51.32%, 50.94%, 49.81% ,24.115 cm , 161.419 g, 184.624 g, 38.01 mm, 22.58mm , 80.39 cm and 5.311 t.ha^{-1}, respectively. The NF of 250 kgN.ha^{-1} was significantly superior to the levels of 175 and 200 kg N.ha^{-1} in all studied conditions.*

Keywords— ***sunflower, nitrogen fertilizers(NF), Flamy(FL), Manon(MA).drip irrigation system.***

I. INTRODUCTION

Sunflower crop (*Helianthus annuus L.*), is most important and strategic oilseed crops of the compound family Asteraceae, its bears difficult climatic conditions when drought or high temperatures, so its cultivation is successful in various climatic conditions, Iraq suffers from a large deficit in the production of vegetable oils. Therefore, attention must be paid to the cultivation of oil crops, the most important of which is the sunflower crop due to the high percentage of oil in its seeds, as it reaches more than 45%, in addition, sunflower oil is characterized by the quality of its chemical and natural properties, also it contained a high protein percentage and was considered an important source in the preparation of animal feeds (Alsharifi.,2009; Iqbal et al.,2021). The Iraqi Ministry of Agriculture sought after 2021, because of the food crisis that the world is going through, it launched the Food Security Initiative and took the administrative and financial responsibility to encourage farmers to plant important agricultural crops that support national food security the most important crops are wheat, barley, rice and corn, also focused on cultivation of oil crops to provide the table oil that the Iraqi family needs as a main source in cooking food. (Alsharifi et al.,2021a; Alaamer et al.,2021; Alsharifi et al.,2022).

The study of (Alsharifi and Ameen 2018; Shtewy et al.,2020a; Al-Jezaaria et al.,2021, showed that planting any crop requires creating a suitable environment for germination by choosing the appropriate machine to complete all agricultural operations from tillage, smoothing, levelling and dividing the field to increase the germination ratio, ease carrying out of crop service operations, throughout the plant growth period until full maturity, important agricultural processes affecting the crop out put, include methods adding of fertilizers formulations and organics acids , as well as planting distances between plants.(Al-Zubaidi, and Al-Awsi 2017). Scientifics basis confirms is the soil analysis before adding fertilizers to know the plant's extent need for the amount and fertilizer type added on the soil's loss basis of it, unless it is organic or chemical, determining the type and fertilizers quantity added to the soil, reflects the chemical and physical properties improvement of the soil and an increase in the plants output.(Alaamer et al.,2021b;

Alsharifi et al.,2022). Adding chemical fertilizers and organic acids in increasing quantities to the soil by means of drip irrigation system or immersion irrigation, after their decomposition in soil , they are absorbed by the plants roots and this is reflected in the balance state within the plant tissues and thus an increase in the plant growth characteristics, the reason for this is due to the improvement of the soil qualities, which were suffering from an acute nutrients shortage for the plant (Al-Mughair .2019; and Ahmed and Al-Tamimi .2020). The study of (Alsharifi et al.,2020a; Shtewy et al.,2020b) showed that Increasing the amount of chemical fertilizers added to the soil may lead to a deterioration in the soil condition resulting from hardening it and preventing the root spread. Therefore, it is preferable to use organic fertilizers, which in turn lead to the fragmentation of the soil (soil fragility), and the improvement of its physical and chemical properties, and the spread of roots abundantly and in great depths, and this is reflected in the improvement of all growth characteristics and yield (Abdullah, 2008; Awais et al.,2015). The aim of the article was to evaluate some plant sunflower traits for two Flamy (FL) and Manon (MA) cultivars at different levels of nitrogen fertilizer.

II. MATERIALS AND METHODS

This study was conducted in 2021, to evaluate some plant sunflower traits under effect nitrogen fertilizers. The experiments were done at three levels of nitrogen fertilizers (NF) of 175, 200 and 250 kgN.ha^{-1}, and two Flamy (FL) and Manon (MA) cultivars . In this study the MF390 tractor use with sweep plow on depth of 20-24 cm to soil stir and prepare a pot suitable for germination, chemical fertilizers were added (DAB type), at a rate of 400 kg.ha^{-1}, then the field was divided according to the planting distances planned in the experiment 25 * 75 (Fig .1), after which the seeds were planted using the planting machine (Blanter type). drip irrigation system was used in this experiment, according to the method used by (Alsharifi et al.,2021b). Nitrogen was added at the first batch after 4 weeks from germination and the second batch added during flowering stage and phosphorous at one level 50 kg N.ha^{-1}, during growth season, Al-Sharifi et al.,2020. The root length (RL), root dry and fresh weight (RDFW), plant dry and fresh weight (PDFW), stem diameter (SD), seed length (SL) PVI, and grain yield (GY), were calculated for each running test.

Calculation of the injection rate, for fertilizer an area of one hectare

$$. Q_F = \frac{F_{R\times A}}{T_{I\times T_{F\times F_C}}}$$

Where ;Q_F ;fertilizer injection rate L.ha^{-1},F_R ;fertilizer rate kg.ha^{-1} , A; The area to be fertilized ha,T_I Irrigation time hour ,T_F ;ratio of fertilizing time to irrigation time ,F_C ; Fertilizer concentration kg.L^{-1}

$$V = \frac{F_{R\times A}}{F_C}$$

Where**; V,** Tank capacity

$$X = F_{C\times R}$$

Where; X the amount of fertilizer added to the tank of the drip irrigation system.

$$Q = \frac{F_{pm}}{C\times 10^6} = Q_{F\times F_C}$$

Or

$$Q = \frac{V}{C} \times \frac{Q}{F_C} \times \frac{EPP}{10^6}$$

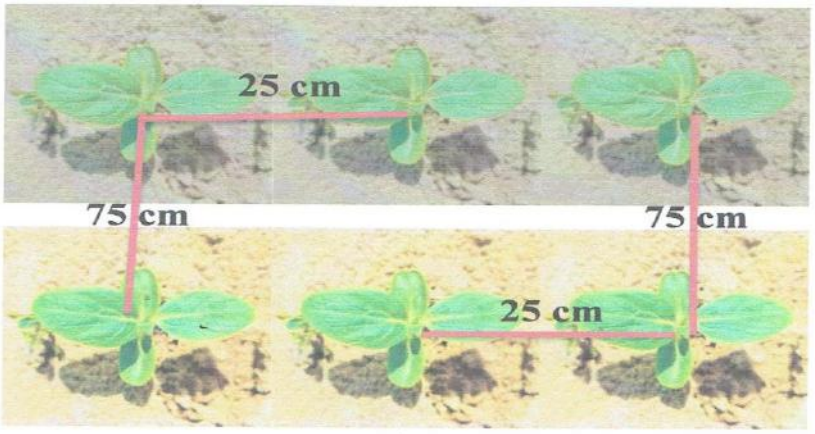

Fig .1. Field cultivation distances for sunflower crop

2.1. Soil texture:

All soil properties (soil density and porosity) were calculated, during the plant growing season, as random samples were taken for several locations in the experimental field after a month of germination (1Mon), two months of germination (2Mon) , the season end (SE) ,according to the methods used by (Al-Jezaaria et al.,2021; Alaamer et al.,2020) the equations below were used to calculate it. (Hu et al.,2012; Hamzah and Alsharifi,2020)..

$$. W_{=\frac{W_w}{W_s}\times 100} \quad (1)$$

Where: W is soil humidity ratio (%), W_w is mass wet soil(kg), W_s is mass dry soil.**(**kg**)**

$$P_{b\ =\frac{M_S}{V_T}} \quad (2)$$

Where: P_b: (mg. m^{-3}), M_S: (mg), V_T: total volume (m^3).

$$T_{SP=}\left(1-\frac{P_b}{P_S}\right)\times 100 \quad (3)$$

Where: T_{SP}: (%), P_b: (mg.m^{-3}), P_S : partial density (2.65 mg.m^{-3}). [26]

Table 1. Chemical and physical analysis of soil particles

Depth	**Texture %**			
	Clay	Silt	Sand	
	45	30	25	Silt Clay loam
	Soil physical properties			
0-25 (cm)	Pb (Mg m^{-3})	TSP (%)	SPR (Kpa)	
	1.36	48.67	1766.423	
	1.38	47.92	1798.090	
	1.41	46.79	1891.315	
VA	1.38	47.79	1818.609	
	Soil chemical properties			
	E.C (ds\cm^3)	HP		
0-25	1.61	6.33		
	Soluble cation meq\I			
	Na	K	Ca+Mg	
	11.14	13.24	56.20	
	O.C (%)	CEC (Meq\100g)	CaCo3 (%)	O.M (%)
	0.58	32.01	4	0.64

2.2. The Crop and Its Attributes

2.2.1. Root Length (RL)

It was calculated according to (Shtewy and Alsharifi .,2020c)

2.2.2 RDFW

2.2.3.PDFW

2.2.4.Stem Diameter (cm): Calculated using the (Vernier machine). (Bajehbaj et al.,2009;Shtewy et al.,2020b)

2.2.5..Seed length (mm): Calculated using (Vernier machine)

2.2.6**. Plant vigor index (PVI)**

Was calculated according to (Ghali et al.,2020 Shtewy et al., 2020a)

$$P_{VI=\frac{P_{L\times G_P}}{100}}$$

Where ; PVI ;plant vigor index cm, P_L ;plant length cm, G_P;Germination ratio.

. **2.2.7.Grains yield;**

The grains yield was calculated (Alsharifi 2009, Alsharifi et al,2021c)

$$G_{Y=GP\times PD}$$

Where ; G_Y;grain yield(t.ha^{-1}),GP; grain rate per plant (kg) , PD; plant density.ha^{-1}.

Fig 2. Field experiment

The obtained results were analysed in the field according to the method approved by .(Oehlent ,2010)..

III. RESULTS AND DISCUSSION

Table (2) shows treatment NF of 175kg N.ha^{-1} reduced the SBD values, after a one month, two months, growing season end, and the results were 1.28,1.29 and 1.32 Mg. m^{-3}, offset by an increased in the TSP, were results,51.69, 51.32 and 50.18% respectively, after a 1Mon, 2Mon and GSE, with the same situation for the NF of 200 and 250 kg N.ha^{-1}), (Hu et al.,2012 , Alsharifi et al.,2021a). The sunflower cultivar (MA), done the best SBD of 1.29,1.30 and1.33Mg.m^{-3}, and the excess in ratios TSP of 51.32, 50.94and 49.81%, with the same situation for the sunflower cultivar (FL).

Table (3) showed that the NF had a significant effect on plant traits and roots, RL, RDFW and PDFW, as the NF of 250 kgN.ha^{-1} exceeded it and gave the highest average of 25.297 cm ,163.109 g and 182.948 g respectively , while the NF of 175kg N.ha^{-1} treatment gave the lowest average of 21.746 cm, 153.737 g and 178.810 g. Perhaps the reason for this is that increasing the fertilizer amount added to the soil improves the plant growth properties by increasing the roots effectiveness and excess their depth in the soil., the results agreed with what was reached by (Shtewy et al.,2020c; Al-Zubaidi and Al-Awsi.,2017),. All plant traits and roots excessed with MA cultivar and scored the higher results 24.115 cm,161.419g and 184.624 g, as compared with FL cultivar which gave the lower results22.471cm, 156.892 g and 177.251g, respectively, (Al-Mughair, 2019;Alaamer et al.,2021a). The interaction among MA cultivar and the NF of 250kgN.ha^{-1} was the best (26.428 cm, 1165.728 g and 1186.775 g). The levels of the plant traits and roots at various conditions are shown in Figure 3 for both Cu and NF.

Table (4) showed that the NF had a significant effect on plant traits and productivity , SD, SL, PVI and GY, the NF of 250 kgN.ha^{-1} exceeded it and gave the highest average of 40.54 mm, 24.88 mm, 80.37 cm and 5.415 t.ha^{-1} respectively , while the NF of 175kg N.ha^{-1} treatment gave the lowest average of 32.81 mm,18.66 mm, 78.53 cm and 4.195 t.ha^{-1}respectively for SD, SL, PVI and GY. Perhaps this is due to the increased plant growth effectiveness and thus increase its productivity, when the fertilizer amount added to the soil increased., the results agreed with what was reached by (Abdullah ,2008; Ahmedand Al-Tameemi, 2020). All plant traits and roots excessed with MA cultivar and scored the higher results 38.01 mm, 22.58 mm, 80.39 cm and 5.311t.ha^{-1} , as compared with FL cultivar which gave the lower results34.29 mm, 20.90 mm, 78.34 cm and 4.105 t.ha^{-1}, respectively, reason for this is the MA cultivar nature and its tolerance to harsh growing conditions such as drought and high temperatures, its ability to achieve the best results of this study. (Awais et al.,2015; Alsharifi et al.,2022). The interaction among MA cultivar and the NF of 250kg N.ha^{-1} was the best 42.86mm, 26.07mm, 81.09 cm and 6.009t.ha^{-1} respectively. The levels of the plant traits and productivity at various conditions are shown in Figure 4 for both Cu and NF.

Table 2. influence of NF levels and Cu on soil properties

Cultivars (Cu)	NF	Soil bulk density			Total of soil porosity		
		1Mon	2Mon	SE	1Mon	2Mon	SE
MA	175	1.26	1.28	1.30	52.45	51.69	50.94
	200	1.30	1.31	1.34	50.94	50.56	49.43
	250	1.31	1.32	1.36	50.56	50.18	48.67
FL	175	1.29	1.30	1.33	51.32	50.94	49.81
	200	1.31	1.32	1.35	50.56	50.18	49.05
	250	1.34	1.36	1.40	49.43	48.67	47.16
Cu	MA	1.29	1.30	1.33	51.32	50.94	49.81
	FL	1.31	1.33	1.36	50.56	49.81	48.67
NF	175	1.28	1.29	1.32	51.69	51.32	50.18
	200	1.30	1.32	1.35	50.94	50.18	49.05
	250	1.33	1.34	1.38	49.81	49.43	47.92
LSD=0.05	MA	0.02	0.03	0.04	0.148	0.154	0.163
	FL	0.04	0.05	0.06	0.155	0.163	0.176
	MA*FL	0.05	0.06	0.07	0.203	0.212	0.255

Table 3. Impact of NF and Cu on plant traits and roots

Cultivars (Cu)	NF	RL cm	RDFW g	PDFW g
MA	175	22.411	156.403	182.415
	200	23.505	162.126	184.682
	250	26.428	165.728	186.775
FL	175	21.081	151.072	175.206
	200	22.175	159.115	177.427
	250	24.166	160.491	179.122
Cu	MA	24.115	161.419	184.624
	FL	22.471	156.892	177.251
NF	175	21.746	153.737	178.810
	200	22.840	160.621	181.054
	250	25.297	163.109	182.948
LSD=0.05	MA	1.314	1.425	2.504
	FL	1.508	1.609	2.624
	MA*FL	1.817	1.913	3.086

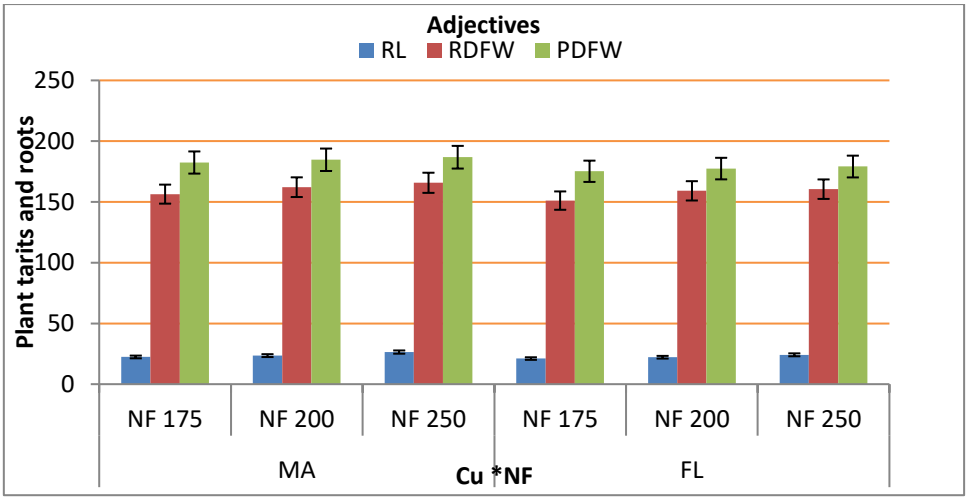

Fig 3. Impact of NF and Cu on plant traits and roots

Table 4. Impact of NF and Cu on plant traits and productivity

Cultivars (Cu)	NF	SD mm	SL mm	PVI cm	GY t.ha^{-1}
MA	175	34.62	19.18	79.92	4.903
	200	36.55	22.51	80.16	5.021
	250	42.86	26.07	81.09	6.009
FL	175	31.01	18.13	77.13	3.488
	200	33.65	20.87	78.24	4.008
	250	38.22	23.69	79.65	4.819
Cu	MA	38.01	22.58	80.39	5.311
	FL	34.29	20.90	78.34	4.105
NF	175	32.81	18.66	78.53	4.195
	200	35.10	21.69	79.20	4.514
	250	40.54	24.88	80.37	5.415
LSD=0.05	MA	1.521	1.526	1.326	0.142
	FL	1.509	1.719	1.551	0.214
	MA*FL	2.133	2.113	2.675	0.423

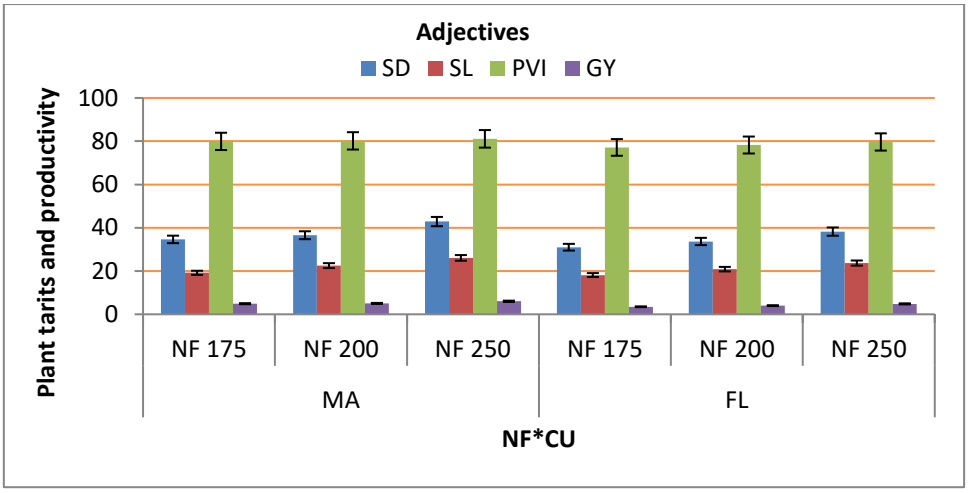

Fig. 4. Impact of NF and Cu on plant traits and productivity

IV. CONCLUSIONS

The sunflower cultivar of MA, was exceedingly significantly than sunflower cultivar of FL. Also the level NF of 250 kg N.ha^{-1},was superior significantly than two levels other NF 175kg N.ha^{-1}and 200 kg.N.ha^{-1}), in all studied conditions. were higher results when interaction between MA cultivar and NF Of 250 kg N.ha^{-1}) , and in all studied conditions.

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