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A review: Effect of planting dates and added nitrogen fertilizers levels on growth and sesame yield

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Abstract

Effect of planting dates (PD) and nitrogen fertilizers (NF) on growth of sesame plant, were tested at two PD of 1July and 15 July, and three NF levels 70 ,100and 130 kg.ha^{-1}. The experiments were conducted in a factorial experiment under complete randomized design with three replications. The results showed that the PD of 15 July was significantly better than the PD of 1 July cm in all studied conditions. The RL, PL, PVI, 1000-WG and GY, 24.79 cm , 153.73 cm, 64.05 cm, 7.45g, and 0.91 t.ha^{-1}, the treatment NF of 130 kg.ha^{-1} was significantly superior to the levels of 70 and 100 kg.ha^{-1} in all studied conditions. With the exception of the physical soil properties represented by the density and porosity of the soil, best results were achieved with a planting dates of 15 July and a nitrogen level of 70 kg.ha^{-1}.

Keywords: Sesame; SDIS; Levels nitrogen fertilizer (NF); Planting dates (PD)

1. Introduction

Sesame crop *(Sesamum indicum L.)* is considered one of the important oil crops, its importance comes from the fact that the demand for it is derived from the demand on nutritional vegetable oils, which constitute a basic dietary pattern for the consumer. In Iraq, sesame crop is grown to produce oil for dual or triple purposes, as in the sunflower crop [1],[2] ,[3]. Despite the relentless pursuit of Iraqi Agriculture Ministry, and farmers encouragement to increase the areas cultivated with oil crops important for the Iraqi family, these products do not meet the needs of the market and the consumer, as the oily crops agricultural production does not secure the ambition to meet the needs of the Iraqi family, meaning that there is a food gap in terms availability and consumer The reason for this is due to the unstable security situation in the country, in addition to the great shortage agricultural supplies and equipment which important, for increase cultivated area and the crops productivity[4],[5],[6].

The study of [7],[8],[9], showed when cultivating crops with high productivity, it is required to provide a suitable environment for germination and growth throughout the plant life, and this focuses on some necessary agricultural operations, which are tillage, leveling, sowing, following cultivation methods in a scientific manner by determining the distance between the planting lines in addition to the distance between one plant and another, in order to achieve the highest productivity and characteristics plant growth. [10],[11]. Increase in nitrogen fertilizers added to the one hectare area one significantly increased all growth characteristics and seed yield compared to the decrease in the amount of nitrogen fertilizers added to same of the area, reason for this is attributed to the positive effect on improving the plant growth characteristics [12],[13].

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The soil preparing process for cultivation is important because of its impact on the plant growth. Since the availability of a suitable bed for the seed helps in good growth and better production to obtain a high economic, and by changing the condition of the soil in a way that suits the plant, such as good ventilation, appropriate humidity, and the temperature required for the plant, and by improving the soil properties, water and salts can be absorbed more, which helps in burying crop residues and killing the weeds that compete with plants for sunlight and water, as well as reducing pathogens and insect eggs, which leads to an improvement in the yield quality. [14],[15] .

According to the method of [16],[17],[18]. The productivity of any crop is affected by many factors, including the type and seeds size, climatic conditions, and fertilizers, as well as the soil physical properties. Crop yield may be affected by factors including the use of low-yielding varieties. [19],[20], the grain yield is the main goal that both plant breeders and producers strive to achieve. It is considered a function of plant yield as well as the number of plants per unit area, and depends on three main factors: genetic, environmental and management factors. It is the most important field measure because it reflects the final result of the vital activities carried out by the plant. During the growth phase until full maturity and harvest [21],[22], the biological crop is the sum of the dry matter produced by the plant in all its parts, and it has a high value in scientific standards in the field of the productive capacity of the plant to convert the largest amount of vegetative dry matter to the reproductive part[23],[24]. The aim of the article was to evaluate some plant sesame properties for local No. 28 cultivar, at different levels of nitrogen fertilizer.

2. Materials and Methods

A field experiment was carried out in the Babylon governorate during the agricultural season 2022, to study the response of the local sesame cultivar (No.28),. For planting dates, and nitrogen fertilization levels on growth, yield and its components, under three levels of nitrogen fertilizers (NF) of 70, 100 and 130 kg.ha^{-1}, and two cultivation dates 1th July, 15th July. In this study the MF250s tractor use with moldboard plow on depth of 25-30 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 cultivation distances planned in the experiment, after which the seeds were planted using the cultivation machine (Disc spreader), drip irrigation system was used in this experiment (Fig. 2), according to the mode approved by [26],[27]. The root length (RL), plant length (PL), 1000-grain weight (1000-GW), PVI, and grain yield (GY), were calculated for each running test.

2.1. Soil texture

Table 1 Chemical and physical analysis of soil particles

Depth	**Texture %**			
0-25 (cm)	Clay	Silt	Sand	
	45	30	25	Silt Clay loam
	Soil physical properties			
	Pb (Mg m^{-3})	TSP (%)	SPR (Kpa)	
	1.34	49.43	1852.089	
	1.37	48.30	1898.087	
	1.43	46.00	1891.403	
VA	1.38	47.91	1918.219	
0-25	Soil chemical properties			
	E.C (ds\cm^3)	HP		
	1.61	5.33		
	Soluble cation meq\I			
	Na	K	Ca+Mg	
	10.14	14.24	55.20	
	O.C (%)	CEC (Meq\100g)	CaCo3 (%)	O.M (%)
	0.58	32.01	4	0.64

Soil properties (soil density and porosity) were calculated, during the plant growing season, after a one month (1Mon), two months (2Mon) and the season end (SE) of germination ,according to the methods used by [28],[29].

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

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]

2.2. The Crop and Its Attributes

2.2.1. Root Length (RL)

It was meant consistent with[30],[31]

2.2.2. Plant length (PL)

2.2.3. 1000-grain weight (1000-GW)

2.2.4. Plant vigor index (PVI)

Was calculated according to [32],[33]

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

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

2.2.5. Grains yield

The grains yield was calculated [34],[35]

$$G_Y = GP \times PD$$

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

Figure 1 Field experiment

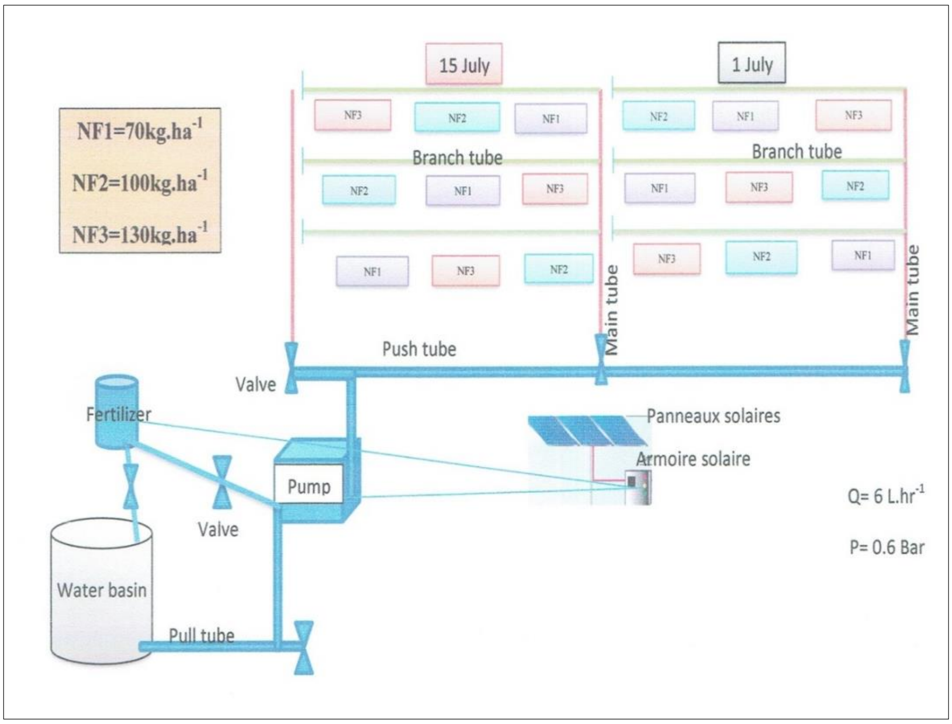

Figure 2 Drip irrigation system for the study site

3. Results and Discussion

3.1. Soil Physical Properties

Table 2 Impact of planting dates and nitrogen fertilizers on soil physical property

Planting dates	NF kg.ha-1	Soil bulk density			Total of soil porosity		
		1Mon	2Mon	GSE	1Mon	2Mon	GSE
1 July	70	1.29	1.30	1.32	51.32	50.94	50.18
	100	1.30	1.32	1.33	50.94	50.18	49.81
	130	1.31	1.34	1.35	50.56	49.43	49.05
15 July	70	1.28	1.29	1.30	51.69	51.32	50.94
	100	1.30	1.31	1.32	50.94	50.56	50.18
	130	1.30	1.32	1.33	50.94	50.18	49.81
PD	1July	1.30	1.32	1.33	50.94	50.18	49.81
	15 July	1.29	1.31	1.32	50.32	50.56	50.18
NF	70	1.28	1.29	1.31	51.69	51.32	50.56
	100	1.30	1.31	1.33	50.94	50.56	49.81
	130	1.31	1.33	1.34	50.56	49.81	49.43
LSD=0.05	PD	0.03	0.05	0.06	0.134	0.155	0.161
	NF	0.04	0.06	0.07	0.145	0.164	0.179
	PD*NF	0.06	0.07	0.09	0.231	0.259	0.285

The significant effect of soil physical properties during 1Mon, 2Mon and the GSE, Table .2. The results obtained for the planting dates treatment of 15 July were 1.29,1.31 and 1.32 $Mg.m^{-3}$, soil density decrease was accompanied by an increase in its porosity ratios were 50.32,50.56 and 50.18%, respectively, while the results obtained for the planting dates treatment of 1 July were tended to increase soil density and decrease its porosity 1.30, 1.32,1.33$Mg.m^{-3}$, 50.94,50.18and 49.81% respectively, the source this accretion in planting dates leading to soil adhesion and cohesion, and this was reflected in the increase in soil density and decrease in its porosity [10,14]. The best results obtained are for the fertilization treatment 70 $kg.ha^{-1}$were 1.28, 1.29 and1.31 $Mg.m^{-3}$, and are matched by a significant increase in porosity ratios were 51.69, 51.32 and 50.18% respectively, compared to other treatments. Filling soil voids and its cohesion when increasing the quantities of fertilizers added to the soil, which led to a decrease in soil properties for this study. [2], [9].

3.2. Growth indicators for sesame plant

By extrapolating the resulting data From Table 3, found that the best results was for the growth indicators for sesame plant RL, PL and PVI of 25.18 cm,154.81 cm and 66.38 cm respectively, as a result of the bilateral superposition between 15 July planting date, and 130 $kg.ha^{-1}$ amount of nitrogen fertilizer added.

Table 3 Impact of planting dates and nitrogen fertilizers on growth indicators for sesame plant

Planting dates	NF $kg.ha^{-1}$	RL	PL	PVI
1July	70	22.17	141.11	54.21
	100	23.08	145.15	59.18
	130	24.17	148.13	60.23
15 July	70	24.33	150.21	61.73
	100	24.86	154.16	64.04
	130	25.18	156.81	66.38
Mean of PD	1July	23.14	144.79	52.87
	15July	24.79	153.73	64.05
Mean of NF	70	23.25	145.66	57.97
	100	23.97	149.65	61.61
	130	24.68	152.47	63.31
LSD=0.05	PD	1.146	2.341	1.304
	NF	1.293	2.468	1.416
	PD*NF	1.615	2.789	1.734

Figure 3.shows that significant differences were achieved for the planting dates treatment, and the highest average length of roots was 24.79 cm at the planting date 15 July and the lowest average length of roots 23.14cm was at the planting date 1 July. From the same figure, the 130 $kg.ha^{-1}$ fertilization treatment was superior by giving the largest average root length of 24.68 cm, while the lowest average root length of 23.25cm was recorded with the 70 $kg.ha^{-1}$ fertilization treatment. The reason for this is due to the unsuitable climatic conditions, especially at high temperatures, offset by a decrease in the nitrogen fertilization amount, which led to a decrease in the roots length[9], [10] .

Figure 4, shows that significant differences were achieved for the planting dates treatment, and the highest average length of plant was 153.73 cm at the planting date 15 July and the lowest average length of plant 144.79cm was at the planting date 1 July. From the same figure, the 130 $kg.ha^{-1}$ fertilization treatment was superior by giving the largest average plant length of 152.47 cm, while the lowest average plant length of 145.66 cm was recorded with the 70 $kg.ha^{-1}$ fertilization treatment. Plant inability in obtain on food and water due to the low length of the roots, and this was reflected negatively on the plant’s height characteristic. [1], [8]

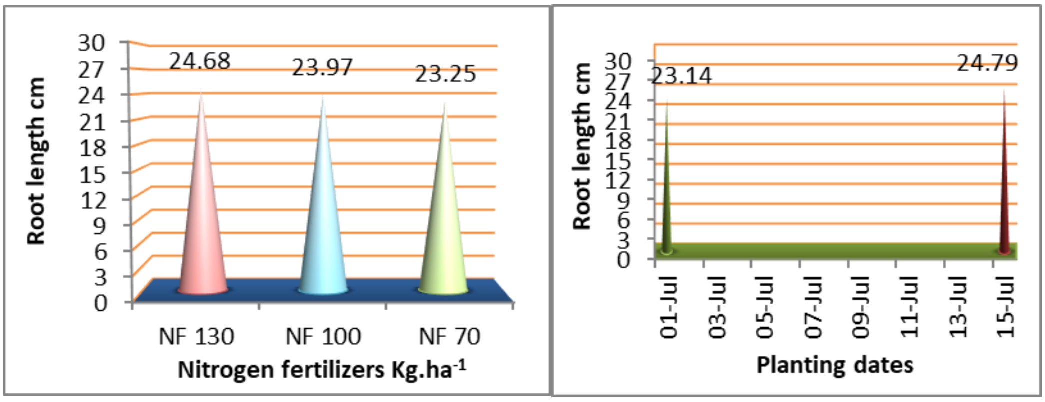

Figure 3 Impact of PD and NF on RL

Figure. 5,shows that significant differences were achieved for the planting dates treatment, and the highest average PVI was 64.05 cm at the planting date 15 July and the lowest average PVI of 144.79cm was at the planting date 1 July. From the same figure, the 130 kg.ha^{-1} fertilization treatment was superior by giving the largest average PVI of 63.31 cm, while the lowest average PVI of 145.66 cm was recorded with the 70 kg.ha^{-1} fertilization treatment. Plant inability in obtain on food and water due to the low length of the roots, and this was reflected negatively on the PVI characteristic. [17], [11]

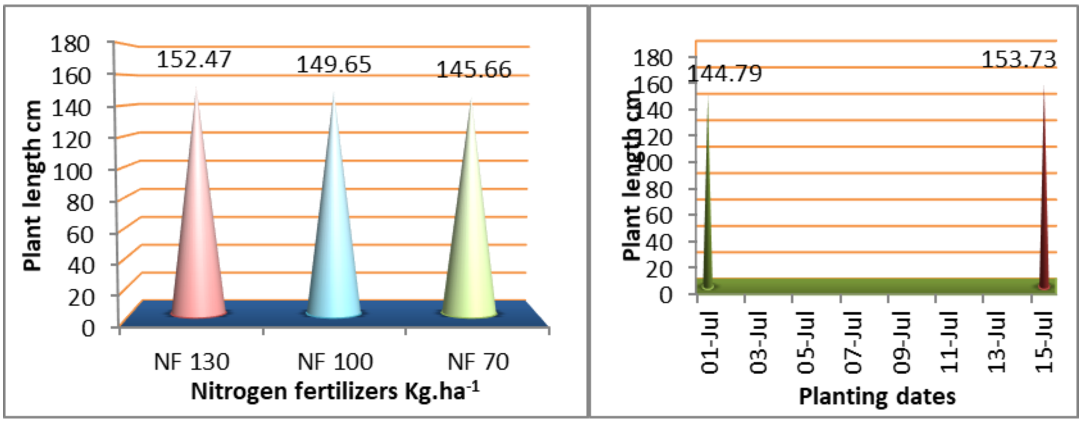

Figure 4 Impact of PD and NF on PL

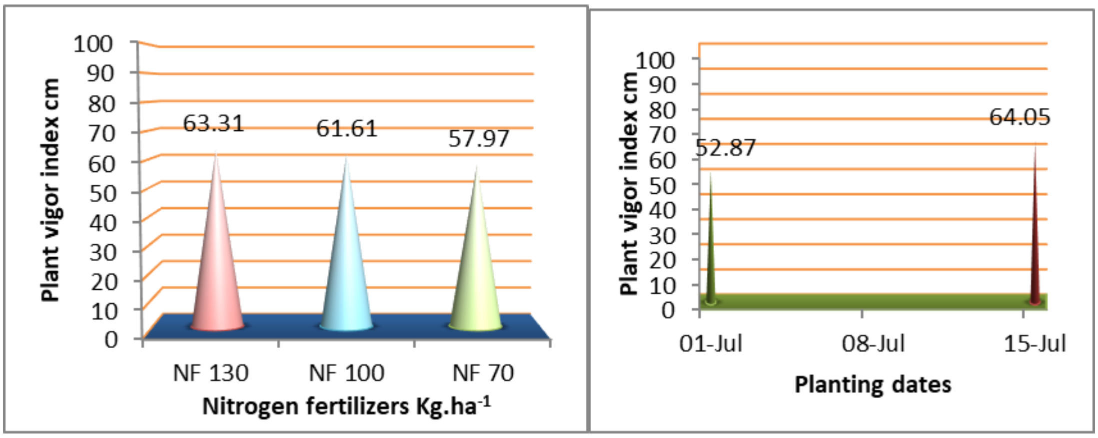

Figure 5 Impact of PD and NF on PVI

By extrapolating the resulting data From Table 4, found that the best results was for the plant yield 1000-GW and GY, of 8.19 g and 0.97 t.ha^{-1} respectively, as a result of the bilateral superposition between 15 July planting date, and 130 kg.ha^{-1} amount of nitrogen fertilizer added.

Table 4 Impact of planting dates and nitrogen fertilizers on plant yield

Planting dates	NF kg.ha^{-1}	1000-GW	GY
1July	70	5.14	0.78
	100	6.22	0.80
	130	7.04	0.88
15 July	70	6.81	0.83
	100	7.36	0.94
	130	8.19	0.97
Mean of PD	1July	6.13	0.82
	15July	7.45	0.91
Mean of NF	70	5.98	0.81
	100	6.79	0.87
	130	7.62	0.92
LSD=0.05	PD	1.207	0.051
	NF	1.298	0.079
	PD*NF	1.311	0.092

Figure. 6, shows that significant differences were achieved for the planting dates treatment, and the highest average 1000-GW was 7.45 g at the planting date 15 July and the lowest average 1000-Gw of 6.13 g was at the planting date 1 July. From the same figure, the 130 kg.ha^{-1} fertilization treatment was superior by giving the largest average 1000-GW of 7.62 g, while the lowest average 1000-GW of 5.98 g was recorded with the 70 kg.ha^{-1} fertilization treatment. The growth period of the sesame plant was affected by the high temperatures during the growing season, the main reason was the decrease in soil moisture and the hindrance of root growth, which led to a decrease in the 1000 grains weight [21], [28].

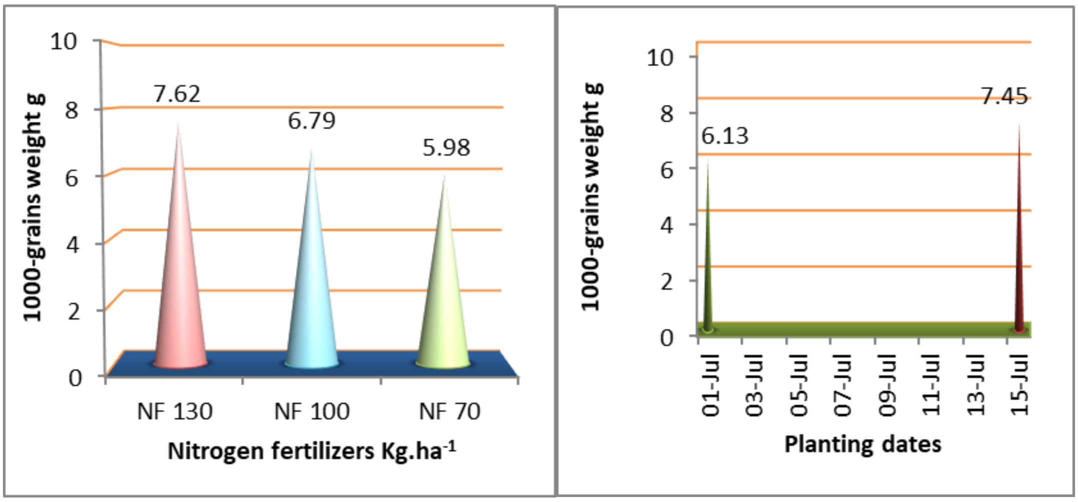

Figure 6 Impact of PD and NF on 1000-GW

Figure. 7,shows that significant differences were achieved for the planting dates treatment, and the highest average GY was 0.91 t.ha^{-1} at the planting date 15 July and the lowest average GY of 0.82 t.ha^{-1}was at the planting date 1 July. From the same figure, the 130 kg.ha^{-1} fertilization treatment was superior by giving the largest average GY of 0.92 t.ha^{-1}, while the lowest average GY of 0.81 t.ha^{-1} was recorded with the 70 kg.ha^{-1} fertilization treatment. The growth period of the sesame plant was affected by the high temperatures during the growing season, the main reason was the decrease in soil moisture and the hindrance of root growth, which led to a decrease in the 1000 grains weight and grain yield[31], [34].

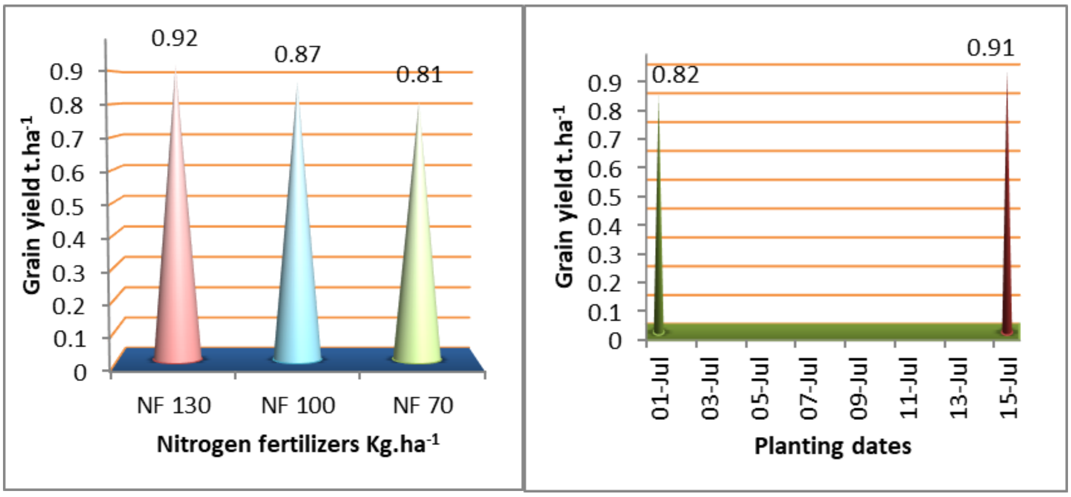

Figure 7 Impact of PD and NF on GY

4. Conclusion

There were significant differences amongst the treatment of planting dates at a level of 15 July it gave the best results as compared the treatment 1 July, which achieved the lowest results for this study. 130 kg.ha^{-1} fertilization treatment was superior than the two treatments 70 and 100 kg.ha^{-1} in most of the studied traits.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflicts of interest.

Authors contribution

SKA and SHA: proposed the research and finalizing the manuscript, data collection, analysis and drafted the manuscript. All authors provided critical feedback and helped to shape the manuscript.

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