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Effect of Nitrogen Rates on Dry Matter Cumulation and Nitrogen Partition of Wheat Plants Under Different Planting Methods

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TWO FIELD trials were conducted at the Agricultural Experiment Station, Faculty of Agriculture Ain Shams University, Kalubia, Egypt during 2013/2014 and 2014/2015 growing seasons to investigate the response of wheat to nitrogen fertilizer rates under different planting methods. Each experiment contained twelve treatments which were the combination of four planting methods (Broadcasting (conventional tilled flat method), rows (20 cm apart), ridge (ridge width 60 cm) and bed (bed width 120 cm)) and three nitrogen fertilizer rates (60, 80 and 100 kg Nitrogen/fad (faddan = 4200 m^2). Design of experiments was split plot design with three replications, where planting methods in the main plot and nitrogen rates in the sub plots. Data revealed that planting methods and nitrogen rats were significant affected on dry weight of wheat plant organs. Leaves; tillers and spikes dry weight (g/m^2) were markedly increased with increasing nitrogen rates (60, 80 and 100 kg N/fad). Weight of leaves was markedly decreased by progressing plants towards maturity. On the other hand, N use efficiency (NUE) and nitrogen physiological efficiency (NPE) exhibiting maximum values, they were 42.68 kg grains/kg applied nitrogen and 43.45 kg grains/kg of N absorbed, respectively when plants were fertilized with 60 kg N/fad followed by adding 80 and 100 kg N/fad. Planting wheat on bed exhibited statistically maximum leaves, tillers and spikes dry weight (g/m^2) in comparable to the other plant methods during phenological stages of wheat growth. Planting wheat on bed exhibiting maximum nitrogen use efficiency (42.50 kg grains/kg N applied) and nitrogen physiological efficiency (43.28 kg grains/kg N absorbed). Grain nitrogen yield (GNY), straw nitrogen yield (SNY) and total nitrogen yield (TNY), were increased by increasing nitrogen rates up to 100 kg N/fad under sowing methods treatment. Meanwhile 60 or 80 kg N/fad exhibited maximum values of NUE and N recovery efficiency (NRE) under sowing on ridge or on bed.

Keywords: *Triticum aestivum*, Wheat, Planting methods, Nitrogen rates, Dry matter accumulation, Nitrogen partitioning efficiency.

Introduction

Wheat is the major and essential crop in Egypt. It grows in Egypt on an area of 3.39 million faddan (faddan = 4200m^2) with an annual production of about 9.28 million tones and with an average yield of 2.74 tons per faddan during 2014-2015 growing season (CLAC, 2015).

Planting method has an important role, suitable seed depth achieves better germination and subsequent yield. Planting wheat with different methods depends on available soil water, planting date and available planting machine. It's planted through broadcasting on a large area, although it requires high seed rate and results low yield. While planting wheat in drill is a recommended method due to uniform seed distribution at suitable depth and usually gave high yield. Planting wheat in line gave maximum grain yield compared with different planting methods (Fenech & Papy, 1977; Singh & Singh, 1992; Singh et al., 1994; Galichenko, 1994 and Kilic, 2010).

Wheat sowing on beds has an easy control of weeds by mechanical means, as well as, increases water use efficiency and nitrogen use efficiency. Planting on beds and lines facilitates the irrigation process and applied of fertilizer and found that the appropriate methods of agriculture, especially on

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beds, which increase the fertilizers use efficiency and water distribution, also reduce the incidence of weeds and reduce the rate of seeds with increasing grain yield (Hobbs et al., 2000 and El-Hadidi et al., 2015). Planting wheat on narrow beds gave similar leaf area index to that traditional planting method, while planting in wider beds produced less leaf area index than that in traditional planting method (Mollah et al., 2015).

Under ideal conditions, nitrogen availability is one of the most critical variable factors and because of deficiency in the available nitrogen and organic matter; therefore farmers tend to apply nitrogen in excess amount over the requirements (El-habbal et al., 2008). By increasing nitrogen fertilization, the wheat crop is increasing, but the excessive increasing is working on groundwater pollution (Semenov et al., 2007). The use of high levels of nitrogen fertilization makes wheat plants express their production capacity, this requires determining the optimal rate of nitrogen fertilization in order to reduce the losses during the growth of the crop and avoid pollution of groundwater and its harmful impact on the environment and human health. Nitrogen and phosphorus from chemical fertilizers, individually but especially while interacting, contribute to the accumulation of protein and gluten in wheat caryopsis (Agapie et al., 2016).

Nitrogen use efficiency is grain yield kg/kg of available nitrogen. It is difficult to measure available nitrogen and total nitrogen in the plant, therefore it is replaced by measuring the added nitrogen to soil and the absorbed nitrogen in the vegetative parts, respectively. As well, nitrogen use efficiency can be divided into components of absorbed nitrogen efficiency and nitrogen physiological efficiency. These two components are expressed nitrogen use efficiency (Moll et al., 1982; Dawson et al., 2008 and Haile et al., 2012). This investigated aim to detect the performance of wheat at different nitrogen fertilizer levels under different sowing methods.

Materials and Methods

Two field experiments were carried out in Agric. Expt. Farm at Shalakan, Kaleobia Governorate, Cairo, Egypt during 2013/2014 and 2014/2015 growing seasons to study the response of bread wheat (*Triticum aestivum* L.) cultivar Sids 12 to nitrogen fertilizer under different planting methods. Each experiment included 12 treatments which were the combination between three nitrogen fertilizer rates (60, 80 and 100 kg Nitrogen/ fad) and four planting methods at the seed rate of 50 kg/fad. Plant methods included, broadcasting (conventional tilled flat method), rows (grains were drilled in a dig long narrow furrow 20 cm apart rows), ridge (grain were drilled on three dig long narrow furrows on ridge (ridge wide 60cm)) and raised bed (grain were drilled on six dig long narrow furrows on bed (bed side 120cm)). The experimental design used was split plot design in 3 replications. The planting methods were arranged in the main plot and nitrogen fertilizers were allocated in the sub plots. The experimental unit area (plot area) was 3.6 × 4m (14.4m^2).

The mineral nitrogen fertilizer was applied as ammonium nitrate (33.5% N). The N fertilizer was added in two equal portions. The first portion was added just before the first irrigation, and the second portion was added just before the second irrigation. All recommended agronomic practices were uniformly applied to all of the experimental units.

Data recorded

Dry matter partitioning

At the different stages of growth, sample of 0.06 m^2 was chosen at random from every treatment in three replications at booting, heading and physiological maturity to determine dry weight of tillers, leaves and spikes by drying the samples in an oven at 105°C to constant weight to estimate dry matter partitioned to tillers, leaves, spikes and biomass (% of total plant biomass).

Nitrogen physiological parameters

The accumulated total nitrogen in grains and straw yields were estimated using micro-Kjeldahl apparatus according to AOAC (1995) to calculate nitrogen physiological parameters including nitrogen recovery efficiency (NRE = kg N absorbed*100/kg N applied/fad), nitrogen use efficiency (NUE = grain yield in kg/fad / N applied kg/fad), nitrogen harvest index (NHI = total N in grains*100/total N uptake) and nitrogen physiological efficiency (NPE = grain yield in kg/fad / N absorbed kg/fad) were calculated according to Timsina et al (2001). The mechanical and chemical analyses of the experimental soil were estimated according to Black (1965) and Jackson (1967). Mechanical and chemical analysis of the experimental soil are presented in Table 1.

TABLE 1. Soil mechanical and chemical analyses of experimental farm during 2013 / 2014 and 2014 / 2015 seasons.

Mechanical analysis	Average	Chemical analysis	Average
Sand %	16	pH	7.3
Silt %	29		
Clay %	55	EC (dS/m)	1.1
		Organic Mater %	1.81
Soil texture	Clay loam	Nutrients(mg/kg soil)	
		Total N	1200
		P	95
		K	12.7

Statistical analysis

The obtained data were computed for proper statistical analysis according to SAS Program (2003). The LSR at 5% level of significance was used to differentiate between means. Data of 2013/2014 and 2014/2015 growing seasons were subjected to homogeneity variance test for running the combined analysis of the data.

Results and Discussion

Effect of nitrogen fertilizers

Dry matter partitioning

Dry weight of wheat vegetative parts under different nitrogen fertilizers including leaves and tillers at booting stage in addition to leaves, tillers and spikes at heading stage and physiological maturity were studied at phenological stages. Data in Table 2 cleared that leaves, tillers and spikes dry weight were markedly varied, being in increasing order with different nitrogen rates 60, 80 and 100 kg N/fad. The weight of leaves was markedly decreased by progressing plants towards maturity. These decreases were associated with increasing spikes dry weight up to physiological maturity. This could be due to the transmission of photosynthetic products from the vegetative parts to fruit parts, in accordance with Temsina et al. (2001) and El-Habbal et al. (2008).

Table 3 cleared that the distribution percentage of vegetative parts of wheat (leaves, tillers and spikes) were significantly varied versus phenological stages under different nitrogen rates. The percentages of leaves scored the highest values at booting stage as compared with heading stage and physiological maturity stage. Nitrogen rate 60 kg N/fad exhibited statistically maximum percentages of leaves under all phenological stages followed by 100 kg nitrogen rate fertilizer and 80 kg nitrogen fertilizer rate/ fad. As the plants progress towards maturity, the distribution ratio decreases significantly. The decline accompanied with increase of spikes % ranging from 38.52 for 60 kg N/fad to 40.69% for 80 kg N/fad of total plant dry weight.

Nitrogen physiological efficiency

Data of grain nitrogen yield (GNY), straw nitrogen yield (SNY) and total nitrogen yield (TNY), nitrogen use efficiency (NUE), nitrogen recovery efficiency (NRE), nitrogen physiological efficiency (NPE) and nitrogen harvest index (NHI) traits were differed greatly depending on the nitrogen fertilizers. Table 4 shows that GNY, SNY and TNY were increased by increasing nitrogen rates up to 100 kg N/fad. On the other hand, NUE and NPE reached maximum values 42.68 kg grains/kg nitrogen applied and 43.45 kg grains/kg N absorbed, respectively when plants fertilized by 60 kg N/fad followed by fertilizing with 80 and 100 kg N/fad. While, NRE% highest values (99.93 and 98.62%) recorded with 80 kg N/ fad. and 60 kg N/fad, followed by 100 kg N/fad. As for nitrogen harvest index, the data in Table 4 finding slight differences with studying nitrogen rates to be ranged between 85.28 to 85.77%. These results are similar with that obtained by Tahir et al. (2005) and Haile et al. (2012).

Effect of planting methods

Dry matter partitioning

Dry weight of wheat vegetative parts with different plant methods was measured at different phenological stages. Table 5, showed significant differences were recorded in dry weight of vegetative parts. Planting on bed scored statistically highest leaves, tillers and spikes dry weight in comparison with the other plant methods followed by planting on ridge, drill and broadcasting during phenological stages of wheat growth. These results are in an agreement with Kilic (2010).

TABLE 2. Leaves, tillers and spikes dry weight at different stages of wheat plants as affected by nitrogen fertilizer rates. (average data of 2013/2014 and 2014/2015 growing seasons).

Nitrogen fertilizer kg N/fad	Leaves (g/m²)			Tillers (g/m²)			Spikes (g/m²)		Biomas (g/m²)		
	Booting	Heading	Physiological maturity	Booting	Heading	Physiological maturity	Heading	Physiological maturity	Booting	Heading	Physiological maturity
60	297.91c	338.03c	318.04c	440.00c	549.67c	725.33c	195.60c	651.44c	737.90c	1083.3c	1694.8c
80	351.06b	380.38b	365.58b	559.26b	670.66b	861.74b	270.00b	840.94b	910.32b	1321.0b	2068.3b
100	377.54a	404.88a	391.80a	597.51a	711.14a	901.64a	282.44a	876.84a	975.05a	1398.5a	2170.3a

TABLE 3. Influence of nitrogen fertilizer rates on dry matter partitioning of leaves, tillers and spikes (%) at phonological stages of wheat growth (average data of 2013/2014 and 2014/2015 growing seasons).

Nitrogen fertilizer kg N/fad	Booting		Heading			Physiological maturity		
	Leaves	Tillers	Leaves	Tillers	Spikes	Leaves	Tillers	Spikes
60	40.55a	59.45b	31.38a	50.55a	18.07b	18.77a	42.72a	38.51b
80	38.58b	61.42a	28.81b	50.78a	20.41a	17.66c	41.65b	40.69a
100	38.72b	61.28a	28.95b	50.88a	20.17a	18.05b	41.55b	40.40a

TABLE 4. Influence of nitrogen fertilizer rates on nitrogen characters of wheat plant. (average data of 2013/2014 and 2014/2015 growing seasons).

Nitrogen fertilizer kg N/fad	N yield (kg/fad)			NUE	NRE %	NPE	NHI %
	Grain	Straw	Total				
60	50.48c	8.68c	59.16c	42.68a	98.62a	43.45a	85.28a
80	68.47b	11.48b	79.95b	39.12b	99.93a	39.42b	85.60a
100	76.40a	12.68a	89.08a	33.99c	89.08b	38.45c	85.77a

NUE = Nitrogen use efficiency
NPE = Nitrogen physiological efficiency
NRE = nitrogen recovery efficiency
NHI = Nitrogen harvest index.

TABLE 5. Leaves, tillers and spikes dry weight at different stages of wheat plants as affected by plant methods (average data of 2013/2014 and 2014/2015 growing seasons).

Planting method	Leaves (g/m^2)			Tillers (g/m^2)			Spikes (g/m^2)		Biomass (g/m^2)		
	Booting	Heading	Physiological maturity	Booting	Heading	Physiological maturity	Heading	Physiological maturity	Booting	Heading	Physiological maturity
Broadcasting	319.74b	348.15d	329.65d	483.50c	574.85d	766.85d	222.23d	745.20d	803.2c	1145.2d	1841.7d
Drill in rows	331.08b	364.77c	348.13c	509.25b	629.97c	801.72c	234.76c	774.53c	840.6b	1229.4c	1924.4c
Drill on ridge	353.14a	386.27b	371.58b	559.51a	678.80b	861.81b	264.83b	814.55b	912.7a	1329.9b	2047.9b
Drill on bed	364.71a	398.53a	384.54a	576.50a	691.77a	887.90a	275.57a	824.69a	941.2a	1365.9a	2097.1a

Furthermore, Table 6 shows a different trend in the percentage of dry matter partitioning expressed from the total dry weight of plant. Sowing wheat grains at broadcasting achieved the highest significant ratio of leaves at booting and heading stages while, the highest significant ratio of leaves at physiological maturity was obtained by planting wheat on bed. On the contrary, the highest percentages of tillers at booting, heading and physiological maturity were obtained by sowing wheat plants on ridge, drill sowing and on bed, respectively. While, the highest spikes percentages at heading and physiological maturity were obtained by sowing wheat plants on bed and broadcasting, respectively. A decrease in the percentage of leaves and tillers was observed through progress of the plants towards maturity.

Nitrogen physiological parameters

Data in Table 7 showed that planting wheat on bed exhibited the highest values of nitrogen use efficiency (42.50 kg grains/kg N applied) and nitrogen physiological efficiency (43.28 kg grains/kg N absorbed). While, the highest values of nitrogen recovery efficiency (99.85) were obtained by wheat plants sowing on ridge. Concerning grain nitrogen yield, straw nitrogen yield, total nitrogen yield and nitrogen harvest index, the data in Table 7 find slight differences among the studied planting methods.

Effect of the interaction between nitrogen fertilizers and planting methods

Dry matter partitioning

The interaction between nitrogen fertilizers and planting methods affected significantly in dry weight of above ground vegetative organs which was measured at different stages as found in Table 8. Data in Table 8 cleared that dry weight of leaves and tillers were clearly decreased by progressing plants towards maturity. These decreases were associated with increasing of spikes dry weight up to physiological maturity. Dry weight of above ground vegetative organs was evaluated at different phenological stages were increased by increasing nitrogen rates up to 100 kg N/fad under studied different sowing methods. On the other hand nitrogen rates 80 and 100 kg N/fad showed slight differences versus studying dry weight of above ground vegetative organs was measured at different phenological stages. Cultivation of wheat on beds leads to easily mechanical weed control and increased nitrogen and water use efficiency (Hobbs et al., 2000 and El-Hadidi et al., 2015).

TABLE 6. Influence of planting methods on dry matter partitioning of leaves, tillers and spikes (%) at phonological stages of wheat growth (average data of 2013/2014 and 2014/2015 growing seasons).

Planting method	Booting		Heading			Physiological maturity		
	Leaves	Tillers	Leaves	Tillers	Spikes	Leaves	Tillers	Spikes
Broadcasting	40.05a	59.95b	30.70a	49.96b	19.34bc	17.95b	41.63b	40.42a
Drill in rows	39.62ab	60.38ab	29.85b	51.15a	19.00c	18.15ab	41.70b	40.15ab
Drill on ridge	38.69b	61.31a	29.10b	51.12a	19.78ab	18.19ab	42.13ab	39.68bc
Drill on bed	38.77b	61.23a	29.20b	50.72a	20.08a	18.35a	42.44a	39.21c

TABLE 7. Influence of planting methods on nitrogen characters of wheat plant. (average data of 2013/2014 and 2014/2015 growing seasons).

Planting method	N yield (kg/fad)			NUE	NRE %	NPE	NHI %
	Grain	Straw	Total				
Broadcasting	62.04a	10.78a	72.82a	34.69d	91.06b	38.36b	85.07a
Drill in rows	64.07a	10.89a	74.96a	36.67c	94.22ab	39.34b	85.43a
Drill on ridge	67.79a	11.10a	78.89a	40.55b	99.85a	40.78ab	85.90a
Drill on bed	66.57a	11.03a	77.60a	42.50a	98.38a	43.28a	85.81a

NUE = Nitrogen use efficiency
NPE = Nitrogen physiological efficiency
NRE = nitrogen recovery efficiency
NHI = Nitrogen harvest index

TABLE 8. Leaves, tillers and spikes dry weight at different stages of wheat plants as affected by interaction between nitrogen fertilizer rates and planting methods. (average data of 2013/2014 and 2014/2015 growing seasons).

Planting method	Nitrogen fertilizer kg N/fad	Leaves			Tillers			Spikes		Biomass		
		Booting	Heading	Physiological maturity	Booting	Heading	Physiological maturity	Heading	Physiological maturity	Booting	Heading	Physiological maturity
Broadcasting	60	271.83d	308.10e	279.87f	369.81e	439062h	629.62h	171.26i	601.88h	641.64e	919.0h	1511.4k
	80	327.00c	354.64c	340.05d	505.53d	602.28f	798.09e	238.53e	803.28e	832.54d	1195.5ef	1941.4g
	100	360.38b	381.72b	269.02c	575.17b	682.64c	872.82c	256.59cd	830.44d	935.55b	1321.3c	2072.3e
Drill in rows	60	281.15d	333.49d	305.73e	389.25e	516.35g	678.15g	182.89h	626.43g	670.69e	1032.7g	1610.3j
	80	332.49c	362.60c	347.40d	542.74c	660.16d	831.24d	254.23d	819.65de	875.22c	1277.0d	1998.3f
	100	379.60ab	398.22b	391.25b	596.57ab	713.09ab	895.77b	267.16c	877.51bc	976.16a	1378.5b	2164.5cd
Drill on ridge	60	314.46c	353.27c	339.51d	495.70d	613.87ef	767.17f	204.81g	684.22f	810.15d	1171.9f	1790.9i
	80	360.13b	387.15b	374.10c	576.98b	699.37bc	902.51ab	288.91b	867.16c	937.11b	1375.4b	2143.8d
	100	384.85a	418.39a	401.14ab	605.84a	723.17a	915.76ab	300.78a	892.29ab	990.69a	1442.3a	2209.2ab
Drill on bed	60	324.20c	357.28c	347.06d	505.23d	628.84e	826.37d	223.44f	693.24f	829.43d	1209.6e	1866.7h
	80	384.61a	417.12a	400.77ab	611.79a	720.83a	915.14ab	298.35ab	873.67c	996.40a	1436.3a	2189.6bc
	100	385.33a	421.20a	405.79a	612.47a	725.64a	922.20a	304.93a	907.14a	997.30a	1451.8a	2235.1a

Furthermore, Table 9 shows a different trend in the percentage of dry matter partitioning expressed from the total dry weight of plant. The maximum percentage of leaves showed when wheat plant fertilized by 60 kg N/fad with broadcasting or drill sowing, during booting and heading stages while, maximum percentage of leaves during physiological maturity stage was recorded when wheat plant treated with 60 kg N/fad with all studied planting methods. While the highest percentage of spikes marked when wheat plant fertilized by 80 or 100 kg N/fad with ridge or bed sowing method and 80 kg N/fad with broadcasting or drill sowing method at heading and physiological maturity.

TABLE 9. Influence of interaction between nitrogen fertilizer rates and planting methods on dry matter partitioning of leaves, tillers and spikes (%) at phonological stages of wheat growth (average data of 2013/2014 and 2014/2015 growing seasons).

Planting method	Nitrogen fertilizer kg N/fad	Booting		Heading			Physiological maturity		
		Leaves	Tillers	Leaves	Tillers	Spikes	Leaves	Tillers	Spikes
Broadcasting	60	42.38a	57.62b	33.53a	47.83e	18.64c	18.52ab	41.66cde	39.82c
	80	39.26b	60.74a	29.67bc	50.38cd	19.95b	17.52de	41,11f	41.37a
	100	38.51b	61.49a	28.89bcd	51.67abc	19.44b	17.81cde	42.12c	40.07c
Drill in rows	60	41.94a	58.06b	32.29a	50.00d	17.71d	18.99a	42.11c	38.90d
	80	38.03b	61.97a	28.39cd	51.70abc	19.91b	17.39e	41.60de	41.01ab
	100	38.88b	61.12a	28.89bcd	51.73ab	19.38b	18.07bcd	41.38def	40.55bc
Drill on ridge	60	38.81b	61.19a	30.15b	52.37a	17.48d	18.96a	42.84b	38.20d
	80	38.42b	61.58a	28.16d	50.84bcd	21.00a	17.45e	42.10c	40.44bc
	100	38.85b	61.15a	29.00bcd	50.14d	20.86a	18.16bc	41,46def	40.38bc
Drill on bed	60	39.09b	60.91a	29.54bcd	51.99ab	18.47c	18.60ab	44.27a	37.13e
	80	38.60b	61.40a	29.04bcd	50.19d	20.77a	18.30bc	41.80cd	39.90c
	100	38.62b	61.38a	29.01bcd	49.98d	21.01a	18.15bc	41.26ef	40.59bc

Nitrogen physiological parameters

Interaction between nitrogen fertilizers and planting methods affected significantly on nitrogen physiological characters. Data in Table 10 showed that GNY, SNY and TNY were increased by increasing nitrogen rates up to 100 kg N/fad under different sowing methods. Meanwhile 60 or 80 kg N/fad exhibited maximum values of NUE and NRE under sowing on ridge or on bed. The maximum value of NPE (45.97 kg grains/ kg nitrogen absorbed) was obtained when plants fertilized with 60 kg N/fad and sowing on bed, while nitrogen harvest index was not significant.

TABLE 10. Influence of interaction between nitrogen fertilizer rates and planting methods on nitrogen characters of wheat plant (average data of 2013/2014 and 2014/2015 growing seasons).

Planting method	Nitrogen fertilizer kg N/fad	N yield			NUE	NRE %	NPE	NHI %
		Grain	Straw	Total				
Broadcasting	60	45.79e	8.46c	54.25f	37.23c	90.42de	41.19bcd	84.40a
	80	62.83c	11.34a	74.16d	34.24def	92.71de	37.33e	84.72a
	100	77.51a	12.54a	90.04a	32.54f	90.04de	36.56e	86.09a
Drill in rows	60	49.02de	8.60c	57.62ef	40.74b	96.03cd	42.76abc	85.09a
	80	66.10bc	11.46a	77.56cd	36.16cd	96.94bcd	38.05de	85.24a
	100	77.10a	12.60a	89.67a	33.11ef	89.69e	37.22e	85.97a
Drill on ridge	60	53.96d	9.12bc	63.08e	45.85a	105.14a	43.88ab	85.54a
	80	72.15ab	11.20ab	83.35bc	40.97b	104.18ab	39.74cde	86.55a
	100	77.25a	12.99a	90.24a	34.82de	90.24de	38.76de	85.61a
Drill on bed	60	53.17d	8.57c	61.74e	46.89a	102.89abc	45.97a	86.10a
	80	72.80ab	11.92a	84.72ab	45.13a	105.91a	42.55bc	85.92a
	100	73.75a	12.60a	86.35ab	35.49cd	86.35e	41,31bcd	85.42a

NUE = Nitrogen use efficiency
NPE = Nitrogen physiological efficiency
NRE = nitrogen recovery efficiency
NHI = Nitrogen harvest index

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تأثير معدلات التسميد النيتروجينى على تجمع المادة الجافة وكفاءة توزيع النيتروجين لنباتات القمح تحت طرق زراعة مختلفة

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أقيمت تجربتان حقليتان فى محطة التجارب الزراعية التابعة لكلية الزراعة جامعة عين شمس – شلقان- محافظة القليوبية خلال موسمى الزراعة 2013/2014 و 2014/2015 لدراسة استجابة قمح الخبز للتسميد النيتروجينى تحت طرق زراعة مختلفة. اشتملت كل تجربة على 12 معاملة عبارة عن التألف بين ثلاثة معدلات من التسميد النيتروجينى (60, 80 و100كجم نيتروجين/ فدان) وأربعة طرق زراعة (بدار، تسطير، على خطوط و الزراعة على مصاطب) فى تصميم تجريبى قطعة منشقة مرة واحدة فى ثلاث مكرارات. أشارت النتائج إلى أن كلاً من طرق الزراعة والتسميد النيتروجينى أثرت معنوياً على العينات الخضرية لنباتات القمح، حيث أن الوزن الجاف لأنصال، افرع وسنابل القمح زادت بزيادة معدل التسميد النيتروجينى. ويلاحظ بشكل واضح وجود انخفاض فى وزن الانصال مع تقدم نباتات القمح نحو مرحلة النضج وصاحب هذا الانخفاض زيادة فى الوزن الجاف للسنابل. من ناحية اخرى سجلت اعلى قيم NUE (42.68 كجم حبوب/كجم نيتروجين مضاف) و NPE (43.45 كجم حبوب/كجم نيتروجين ممتص) عندما سمدت النباتات بـ 60كجم نيتروجين/فدان متبوعاً بالتسميد 80 و 100 كجم نيتروجين/فدان. كما سجلت زراعة القمح على مصاطب أعلى قيم الوزن الجاف للأنصال والأفرع والسنابل مقارنة بطرق الزراعة الاخرى خلال المراحل الفينولوجية لنمو القمح. كما حققت الزراعة على المصاطب اعلى قيم NUE (42.50 كجم حبوب/كجم نيتروجين مضاف) و NPE (43.28 كجم حبوب/كجم نيتروجين ممتص). كما زادت, SNY, TNY GNY بزيادة معدل التسميد النيتروجينى حتى 100كجم نيتروجين/فدان مع طرق الزراعة المختلفة. بينما سجل معدلى التسميد 60 و 80 كجم نيتروجين/فدان اعلى قيم NUE و NPE عند الزراعة على الخطوط أو المصاطب.