Bread wheat varieties influenced by different levels of Nitrogen and phosphorous grown in calcareous soil

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Abstract

Field trails were conducted at the field of the Faculty of Agriculture and Forestry/ university of Duhok/ Semmel District- Duhok Governorate/ Kurdistan region/ Iraq, which located in semi-arid zone, during seasons 2008-2009 and 2009-2010, to study the effect of different levels of Nitrogen and Phosphorous (0.0, 60, 120, and 180) kg N. ha^{-1} , (0.0, 183.2, 229.0, and 274.8) kg P_2O_5. ha^{-1} respectively, on leaf area (cm^2), plant high (cm), number of spikes. $plant^{-1}$, number of grains. $spike^{-1}$, 1000 grain weight, grain yield (g). $plant^{-1}$, of two varieties (Rezgary and Fateh) under rain feed conditions, in silty clay texture soil (classified as Vertisols), characterized as high calcium carbonate, low organic matter content and high pH value. The results showed highly significant effect of year in all studied traits with exception number of grains per spike and the varieties exhibited highly significant effect in plant height, leaf area, 1000 grain weight and grain yield . $plant^{-1}$. The interaction effect between Nitrogen, Phosphorous, and varieties, shows highly significant effects for all traits except number of grains. $spike^{-1}$. Also interaction effects between (Years × Variety × Nitrogen × Phosphorous) gave high significant effects in all studied traits with exception of plant height and number of grains. $spike^{-1}$.

Key words: Bread wheat varieties, Nitrogen, Phosphorous levels, grain yield.

I. Introduction:

Wheat (*Triticum aestivum* L) is belongs to family Poaceae (1). It's the most important, common and dominance winter cereal crop cultivated in this region of Iraq, primarily used as a staple food providing more protein than any other cereal crop. It consumes in many forms like bread, cakes, biscuits, bakery products, and many confectionery products. Also the wheat straw uses in feeding animals as one of the most components the ration [1].

Nitrogen comprises 7 % of total dray matter of plant compositions, plays a vital role in most metabolic reaction which occurs in living plant cells, and it is the main constituent of many fundamental cell components, which involves in the formation of many cell components such as chlorophyll, amino acids, protein, RNA, DNA, ATP, and enzymes system [2] and [3]. So no other element has such important effects on promoting vigorous plant growth as nitrogen. Abundant protein tends to increase the size of leaves and

accordingly, to bring about an increase in carbohydrate synthesis. Nitrogen plays a vital role in increasing the yield of crops. An application of proper amount of nitrogen with balance of other essential elements considered as the main key of obtaining the high yield, healthy, good quality and bumper crop of wheat. High nitrogen supply favorite for conversion of carbohydrates into proteins, which in turn promotes protoplasm formation [2]. [4] reported that N application had little effect on yield, but decreases lodging and spike population, while increases the grain weight. N application at rate (120 kg. ha-1) for wheat has been recommended by several researchers [5] and [6]. [7] state out that nitrogen fertilization caused increases in the number of spike and grain weight of wheat. [8] recorded that the grain yield of wheat increased with nitrogen fertilization.

Like nitrogen the phosphorus also considered as an essential nutrient for plant growth, it is the second key to plant growth after N. It involves in many vital functions and plant growth processes, from energy storage to genetic transfer, protein, starch synthesis, phospholipids formation, coenzymes, nucleotides, and seed yield [9] and [10]. Thus the phosphorous is an essential for vigorous growth and maturation development, an application adequate amount of phosphorous levels increases the root growth, straw strength in cereals also improves its quality, disease resistance, tolerant to risk of winter damage [10].

In view of above finding, due to climatic changes in studied area especially in last decades which causes reduction in the yield, it was imperative to conduct a field experimental involving two wheat varieties to study their response to low and high levels of N and P, under recent climatic conditions, in order to obtain the potential grain yield of these varieties as influenced by studied N and P levels.

II. Materials and methods:

Field experiments were conducted during seasons 2008-2009 and 2009-2010 under rain feed conditions, at the field of Faculty of Agriculture and forestry- Duhok University- Semmel District-Duhok governorate- Kurdistan region/ Iraq. To study the effect of different levels of nitrogen (0.0, 60, 120, and 180) kg N. ha^{-1}, and phosphorous (0.0, 183.2, 229.0, and 274.8) kg P_2O_5. ha^{-1}, on growth and yield of two wheat varieties (Rezgary and Fateh). Nitrogen added in two doses, half with sowing while the remaining half added at tillering stage, using urea 46% N. Phosphorous added at sowing date, using triple super phosphate (46% P_2O_5). Fertilizers were applied through broadcasting as farmers do in this area. Some physical and chemical properties of the soil determined using methods as described by [11], [12], [13] [14] and [15].The soil characterized, by high pH value, high calcium carbonate content, low organic matter content and the soil has silty clay texture table [I]. The field plowed twice each one vertically one on other. The experimental plots comprised rows with three meters in length and (20 cm) distance between rows. The seeds were sowed on 15 / 11 /2008 – 2009 and 2009- 2010, in both seasons with sowing rate (120) kg seeds.ha^{-1}. All cultivated treatments received two supplemental irrigation, the first one at anthesis stage and the second one at the drought stage (season). Weeds controlled by spraying weeds Herbicicide namely Grainstar at rate (5 g/ 400L water / five hectares) before tillering stage.

Table.I: Some Physical and chemical properties of top (0-30) cm soil sample used in the field experiment.

Properties	Values
Sand (g kg^{-1})	90.60
Silt (g kg^{-1})	487.50
Clay (g kg^{-1})	421.90
Soil texture	Silty Clay
Moisture at Field capacity (g kg^{-1})	316.8
pH in soil paste	8.45
EC (dS m^{-1}) at 25ºC in soil paste	0.55
CaCO3 (g kg^{-1})	201.0
Organic matter (g kg^{-1})	15.5
Available N (g kg^{-1})	0.21
Available P (mg kg^{-1})	5.44

All agronomic practices were kept uniformly in all treatments. The studied plant characters were flag leaf area (cm^2) (LA) according to [16], plant high (cm) (P.H.), number of spikes per plant (NSP), number of grains per spike (NGS), 1000 grain weight (g) (1000GW), and grain yield (g) per plant (GYP). All data were recorded on five plants selected randomly from each line (row). The obtained data were statically analyzed using factorial experimental with randomized complete block design, with three replicates, [17].

- Semmel location characterization

Semmel District located in Duhok governorate semi-arid zone in Kurdistan region/ Iraq, on 43:01° E. longitudes, 36: 84° N. latitude. This zone is located on the west of Duhok city. The common and dominance soil order in the region classified as vertisols [18], which considered as a good natural fertile soils at the same time a good productive soil. the soils characterized, high pH value, high in calcium carbonate and low in organic matter content. Because of cropping these lands intensively, due to fluctuation in distribution of precipitations during cropping seasons which subjects the mobile nutrients to leaching process with drain water to out of the root sorption zone, precipitation and fixation of other nutrients which converted to non available forms for plants. This may causes nutrients deficiencies and reduction in plan production and yield of bad quality. Therefore, it is necessary to apply nutrients in order ti increase or at least to maximize reduction in crop productivity. For these reasons the cultivated crop in these lands response to fertilization (inorganic and inorganic).

III- Results and discussion:

Table (II) shows highly significant effect of years (Y) in all studied traits with the exception of NGS, but the varieties, exhibited highly significant effect in P.H.,

LA, 1000 GWT & GYP. Effect of nitrogen, phosphorus, varieties (V) and interaction between V×N×P, showed highly significant effect for all traits with exception of NGS. Also an interaction between Y×V×N×P gave high significant effects in all studied traits with exception of P.H. and NGS.

Table (III) indicates that an interaction between V×N for year 2008 – 2009, gave maximum P.H. value which recorded by Rezgary variety (95.09 cm) at 180 kg N ha^{-1}, while the minimum P.H., recorded by Fateh variety which was (80.13cm) at the Zero nitrogen level (N_0).

When Rely on an interaction between varieties and phosphorous (V×P) levels,. maximum P.H. value was (93.30 cm) recorded by Rezgary at 274.8 kg P_2O_5. ha^{-1}, whenever, the lowest P.H. value for Fateh variety was (80.62cm) at the level 183.2 kg P_2O_5. ha^{-1}. Clear increases found in P.H. as a result of N and P application together, since Rezgary exhibited more responsibility comprising with Fateh variety. According to interaction effect between varieties and nitrogen V×N on LA, the maximum value of LA recorded for Rezgary variety was 62.70 cm^2 at level 60 kg N. ha^{-1}, while the lowest LA value exhibited by Fateh variety which was 42.72 cm^2 at level 120 kgN. ha^{-1}. From same table (III) it appear that Rezgary gave maximum value 58.42 cm2 in LA value due to the interaction effect between varieties and phosphorus (V×P) at level 229.00 kg P2O5. ha-1, while Fateh variety showed lowest LA 40.31 cm2 at level 183.2 kg P2O5. ha-1. In this trait Rezgary variety was more respond to phosphorus level in comparison with Fateh variety. In NSP trait Genotypes responded differently to N levels, since Rezgary gave highest NSP with average (5.39) at 60 kg N ha^{-1} comparing with Fateh variety which recorded the lowest average (4.17) at zero nitrogen level.

While depending on an interaction effect between varieties and phosphorus in NSP, Fateh produced the highest value with an average (5.50) for this trait at 229.0 kg P_2O_5. ha^{-1}, when the same variety gave the lowest value (3.75) at 183.2 kg P_2O_5. ha^{-1}. NGP is one of the most important yield components traits in wheat which not affected by the interaction between varieties, nitrogen and phosphorus levels table (III). While the 1000 GWT highly affected by the varieties, nitrogen and phosphorus level. Rezgary variety recorded the maximum value for this traits (35.61 and 33.28) g at zero kg N. ha^{-1} and 229.0 kg P_2O_5. ha^{-1}. This main trait more affected by phosphorus level, because of the phosphorus role in increasing the flowers fertility in spikes. Whereas, for GYP from table (III) it note, that highest weight of GYP were 224.48 and 200.73 g. $plant^{-1}$ recorded by Fateh and Rezgary varieties respectively, at P and N rates 60 kg N. ha^{-1} and 183.2 kg P_2O_5. ha^{-1} respectively. The yield trend clearly indicated that an application of N and P will lead to increasing in GYP and this may be attributed to balance nutrition for these varieties.

Table.II: Combined mean square analysis for studied traits in (2008 -2009) and (2009 – 2010).

S.O.V.	df	P.H. (cm)	LA (cm^2)	NSP	NGS	1000GW (g)	GYP(g)
Year	1	2900.85**	545.94**	23.03*	55185.47	1537.19*	2146.42*
r ×year	4	17.07	5.97	0.28	62575.45	2.10	66.45
V	1	4579.59**	1120.65**	0.23	62293.34	68.86**	657.19**
N	3	90.88	495.51**	4.35**	66208.45	165.38**	28733.8**1
P	3	8.70	823.26**	5.11**	58209.16	45.91**	5925.58**
Y×V	1	51.97	1441.34**	0.45*	48441.30	180.74**	39.04
Y×N	3	38.04	34.63	1.52**	69065.42	89.79**	321.22**
Y×P	3	5.0	105.08**	2.33**	64135.91	14.88*	132.84
V×N	3	59.96	332.58**	0.39*	58277.72	28.85**	3727.50**
V×P	3	108.54	106.40**	0.34*	58589.41	71.17**	2647.06**
N×P	9	71.35	501.65**	4.05**	65187.62	55.05**	5197.91**
V×N×P	9	61.37	283.03**	1.56**	6461059	35.83**	2510.75**
YVN	3	79.60	138.89**	0.52**	6857.24	37.06**	130.20
Y×N×P	3	92.74	147.08	1.15**	66745.87	11.68**	143.74
Y×NP	9	15.21	228.59**	1.73**	61203.46	11.70*	80.98
YVNP	18	43.38	257.06**	1.26**	63704.41	34.07**	1300.22**
Error	124	29.87	8.24	0.05	63209.74	1.96	39.68

* Significant at p≥ 0.05. ** High Significant at p≥ 0.05.

Table.III: Interaction effect of nitrogen, phosphorous levels and Varieties separately on agronomic traits of wheat growing (2008-2009).

Varieties	N Levels	P.H. (cm)	LA (cm^2)	NSP	NGS	1000GWT (g)	GYP (g)
Interaction between varieties and Nitrogen levels ($kgN.ha^{-1}$)							
V1	N_0	91.58b	50.54c	4.64b	58.70a	35.61a	162.88f
	N_1	91.79b	62.70a	5.39a	34.37a	34.27b	200.27b
	N_2	91.12b	51.12c	4.57b	32.53a	28.86ef	176.65c
	N_3	95.09a	55.60b	4.61b	33.78a	30.12d	172.36d
V2	N_0	80.13d	47.19d	4.17c	35.63a	32.84c	166.81e
	N_1	81.40d	45.32de	5.23a	38.66a	29.53de	224.48a
	N_2	83.75d	42.72e	4.61b	33.58a	28.73f	171.33d
	N_3	81.06d	43.49e	4.53b	34.48a	25.19g	160.73f
Interaction between varieties and phosphorous levels($kg\ P_2O_5.\ ha^{-1}$)							
V1	P_0	91.13b	51.41c	4.80c	34.10a	29.89d	177.30c
	P_1	92.09ab	54.09bc	4.57d	33.56a	32.51bc	164.09b
	P_2	93.05a	58.42a	5.24b	33.33a	33.28a	186.56b
	P_3	93.30a	56.04ab	4.60cd	58.39a	33.18ab	184.21b
V2	P_0	82.14c	44.86d	4.69cd	36.26a	28.14e	166.94e
	P_1	80.62c	40.31e	3.75e	36.70a	28.09e	184.63b
	P_2	82.08c	52.78bc	5.50a	36.60a	32.07c	200.73a
	P_3	81.50c	40.78e	4.60c	32.79a	28.00e	171.05d

Means followed by different letters in the same column are significantly different from each other at P≥0.05.

Table (IV) shows the interaction between varieties, nitrogen and phosphorus in 2009-2010. Rezgary variety was superiority in P.H., obtained highest height (87.82 cm) at level 60 kg N. ha^{-1}, and gave high average of NSP (5.80) at 180 kg N ha^{-1}, When Fateh variety produced highest value for LA, NGS, and GYP, which were (52.72 cm^2, 41.30 and 241.42 gm) respectively, at rate 60 kg N. ha^{-1}. Depending on the interaction between varieties and phosphorus, Rezgary variety recorded the high value for P.H., (88.14 cm) and NSP (5.85) at level 229.0 kg P_2O_5. ha^{-1}, at same level of phosphorous Fateh was superiority in NSP (38.09) and GYP (209.19) g. From the above results appear that some of the studied traits LA, NSP and GYP were highly affected by phosphorous levels.

Table.IV: Interaction effect of nitrogen, phosphorous levels and Varieties separately on agronomic traits of wheat growing (2009-2010).

Varieties	N Levels	P.H. (cm)	LA (cm^2)	NSP	NGS	1000GWT (g)	GYP (g)
Interaction between varieties and Nitrogen levels (kgN.ha^{-1})							
V1	N_0	80.71bc	38.72f	4.89e	30.10a	34.23e	165.48e
	N_1	87.82a	49.89d	5.50bc	32.63a	35.57abc	207.56b
	N_2	84.00	45.46d	5.40c	32.60a	35.22de	188.49c
	N_3	81.79abc	50.49d	5.80a	33.00a	36.70bcd	173.76d
V2	N_0	71.85d	47.19c	5.07d	38.40a	38.50a	166.14e
	N_1	73.57d	52.72a	5.60b	41.30a	38.00ab	241.42a
	N_2	77.60bed	43.80e	5.68ab	34.5a	33.96e	179.17d
	N_3	76.39cd	43.44e	5.35c	36.70a	36.25cd	166.97e
Interaction between varieties and phosphorous levels(kg P_2O_5. ha^{-1})							
V1	P_0	81.95ab	45.74c	5.20d	32.70a	34.33cd	181.97c
	P_1	83.22ab	42.33b	5.40c	32.02a	35.70bc	167.94d
	P_2	88.14a	50.98b	5.85a	33.80a	35.80bc	198.28b
	P_3	81.01bc	45.51c	5.14d	35.40a	37.89a	187.13c
V2	P_0	76.97bcd	54.38c	5.23cd	38.70a	37.46a	171.27d
	P_1	74.59cd	38.04e	5.60b	36.70a	37.15ab	187.25c
	P_2	71.39d	52.25a	5.60b	39.20a	38.09a	209.19a
	P_3	76.59cd	51.49ab	5.27c	36.30a	34.00d	186.00c

Means followed by different letters in the same column are significantly different from each other at P ≥0.05.

Also table (V) shows that highest 1000 GWT obtained with Zero kg N. ha^{-1}×229.0 kg P_2O_5. ha^{-1} (N_0×P_2) level, which was (40.32 g), and the lowest 1000 GWT was (25.38g) was found in 180 kg N. ha^{-1}×Zero kg P_2O_5. ha^{-1} (N_3×P_0). These results show that adding phosphorous to crops will provided their requirements from available phosphorous in balance proportion with N. The data in table (V) shows the effect of interaction between nitrogen and phosphorus on GYP, which indicate that the maximum value was (236.14)g recorded at level 60 kg N. ha^{-1} and 229.0 Kg P_2O_5. ha^{-1} (N_1×P_2), while the minimum value was (145.76g) produced with 180 kg N. ha^{-1} and zero P_2O_5. ha^{-1} (N_3× P_0), this means that Phosphorous application is more important for increasing weight of grain in spike, because the phosphorous is the main source of energy which is main component of (ATP) and protein which concentrated in seeds [2],[3] and [8].

Table.V: Combination effect between nitrogen and phosphorous levels on agronomic traits of wheat varieties growing season (2008-2009).

Combination N×P	p.H. (cm)	LA (cm2)	NSP	NGS	1000 G WT(g)	GYP (g)
N_0 P_0	85.33edfg	47.35def	4.11gef	34.63b	32.14b	151.03h
N_0 P_1	88.98abc	49.46de	4.58a	33.85b	32.17c	162.45g
N_0 P_2	85.35defg	49.50de	4.91c	39.18b	40.32a	186.40e
N_0 P_3	83.76g	49.12de	4.01gef	51.08a	32.27c	159.51g
N_1 P_0	86.88cdef	62.94a	6.20a	37.32b	28.42e	221.31b
N_1 P_1	84.53fg	51.93cd	3.81g	39.12b	34.07b	192.31d
N_1 P_2	86.91cdef	59.39ab	5.70b	33.41b	34.30b	236.14a
N_1 P_3	88.05bc	41.78g	5.53b	36.20b	30.82d	199.75c
N_2 P_0	87.83bcd	35.79h	3.93gf	33.36b	30.13d	170.39f
N_2 P_1	86.93cdef	44.56gef	4.03gef	31.70b	26.13g	172.70f
N_2 P_2	87.31cde	51.74cd	5.81b	31.53b	28.69e	150.27h
N_2 P_3	87.68bcd	55.58bc	4.60d	35.03b	30.23d	202.59c
N_3 P_0	86.50cdef	46.45gef	4.75cd	34.85b	25.38g	145.76h
N_3 P_1	84.93egf	42.84gf	4.23ef	35.85b	28.83e	169.98f
N_3 P_2	90.70a	61.73a	5.05c	35.73b	27.38f	201.77c
N_3 P_3	90.13ab	47.16def	4.26e	30.13b	29.04e	148.68h

Means followed by different letters in the same column are significantly different from each other at P ≥0.05.

Table (VI) indicates that interaction between N and P caused significant differences in most studied traits for was (84.81cm) recorded at interaction level 180 kg N. ha^{-1} × 229.0 kgP_2O_5. ha^{-1} (N_3×P_2), while the lowest value was (71.90cm) produced at level Zero kg N. ha^{-1} × 229.0 kg P_2O_5. ha^{-1} (N_0×P_2). Regarding to LA table (VI) shows that the maximum value was (59.89cm^2) found at 60 kg N. ha^{-1} × Zero kg P_2O_5. ha^{-1} (N1× P0), when the minimum value was (36.0 cm^2) at Zero kg N. ha^{-1} × Zero kg P_2O_5. ha^{-1} (N_0×P_0). These results show that the P.H., and LA increase with increasing levels of N and P with note that LA, increase with application medium rate of nitrogen, because nitrogen is necessary for Chlorophyll formation which increase the rate of photosynthesis and later plant growth [9]. From same table noticed that interaction between (N×P) reveals significant differences in NSP, An interaction at level 120 kg N. ha^{-1} × 274.8 kg P_2O_5. ha^{-1} (N_2×P_3), gave highest value for NSP which was (6.25). While the lowest value for NSP was (3.80) found at Zero kg N. ha^{-1} × 274.8 kg P_2O_5. ha^{-1} (N_0×P_3). Successive increases in phosphorous levels showed a tendency to increase

Table.VI: Interaction effect between nitrogen and phosphorous levels on agronomic traits of wheat varieties growing season (2009-2010).

Combination N×P	p.H. (cm)	LA (cm^2)	NSP	NGS	1000 G WT	GYP (g)
N_0 P_0	77.33ab	36.01k	4.90e	36.30b	32.65e	151.10i
N_0 P_1	80.50ab	37.95j	5.20cd	31.20b	36.15cd	165.gh
N_0 P_2	71.90b	54.10c	6.03ab	36.70b	40.00a	185.99e
N_0 P_3	75.21ab	43.78h	3.80g	32.90b	36.66bc	160.92h
N_1 P_0	81.23ab	59.89a	5.98ab	41.80b	37.09bc	226.68b
N_1 P_1	79.83ab	36.14k	5.80ab	46.60a	38.98ab	202.20d
N_1 P_2	80.38ab	59.16a	5.06de	38.60b	38.21abc	247.71a
N_1 P_3	81.35ab	50.02e	5.36c	38.90b	36.86bc	221.38bc
N_2 P_0	81.60ab	44.53gh	4.18f	32.70b	36.78bc	181.46ef
N_2 P_1	78.71ab	44.96g	5.80b	31.50b	33.71e	173.61gf
N_2 P_2	81.96ab	36.23k	5.93b	29.00b	33.63e	167.68gh
N_2 P_3	80.91ab	52.79d	6.25a	41.00b	34.25de	212.57c
N_3 P_0	77.48ab	41.80i	5.81b	32.10b	37.08bc	147.25i
N_3 P_1	76.58ab	41.67i	5.21cd	35.00b	36.86bc	169.33gh
N_3 P_2	84.81a	56.97b	5.88b	41.80b	35.95cd	213.51c
N_3 P_3	77.48ab	47.42f	5.41c	30.50b	36.01cd	151.38i

Means followed by different letters in the same column are significantly different from each other at P ≥0.05.

the NSP. The same table shows that interaction effect of (N×P) on NGP, recorded the highest value which was (46.60) at interaction level 60 kg N. ha^{-1} × 183.2 kg P_2O_5. ha^{-1} (N_1×P_1), whereas the less number was (29.00) for this trait which observed at 120 kg N. ha^{-1} ×229.0 kg P_2O_5. ha^{-1} (N_2×P_2). For 1000 GWT, the highest GWT was (40.00g) recorded at interaction level Zero kg N. ha^{-1} ×229.0 kg P_2O_5. ha^{-1} (N_0×P_2), when the lowest value of GWT was (32.65g) found at Zero kg N. ha^{-1} ×Zero kg P_2O_5. ha^{-1} (N_0×P_0). The results in table (VI) also demonstrate that interaction among (N×P) levels caused significant difference in GYP. The highest mean of GYP was (247.71g) at 60 kg N. ha_{-1} × 229.0 kg P_2O_5. ha^{-1} (N_1× P_2), whereas the lowest quantity of GYP was (147.25g) obtained at 180 kg N. ha^{-1} ×Zero kg P_2O_5. ha^{-1} (N_3×P_0). This trait more affected comparing with other traits such as LA.

The previous results in table (VI) show that interaction between (N×P) at levels Zero kg N. ha^{-1} × 229.0 kg P_2O_5. ha^{-1} (N_0×P_2), significantly affected on NGS, while the others interaction not lead to apparition significant effect between them in this trait. While the 1000 GWT and GYP more affected by interaction between (N×P) levels. 1000 GWT and GYP more affected by interaction between (N×P) levels.

Table (VII) shows that interaction between varieties, nitrogen and phosphorus on studied traits for the year (2008-2009). Rezgary variety, gave the highest P.H. value which was (101.06 cm) at 180 kg N. ha^{-1} × 274.8 kg P_2O_5. ha^{-1} (N3× P3), When Fateh variety gave the lowest P.H. which was (76.33 cm) at Zero kg N. ha^{-1} ×Zero kg P_2O_5. ha^{-1} (N_0×P_0). This may be attributed to the differences between genetic nature (potential) of varieties and its balance requirement for nitrogen and phosphorus levels. Due to LA trait, Rezgary variety gave the maximum value which was (73.25 cm^2) at 60 kg N. ha^{-1} ×Zero kg P_2O_5. ha^{-1} (N_1× P_0) and the same variety produce lowest value for LA which was (34.85 cm^2), at 120 kg N. ha^{-1} × Zero kg P_2O_5. ha^{-1} (N_2×P_0). The highest value for NSP produced by Fateh variety which was (6.36) at 120 kg N. ha^{-1} ×229.0 kg P_2O_5. ha^{-1} (N_2×P_2), and the same variety recorded the lowest NSP which was (3.43) at 120 kg N. ha_{-1} ×Zero kg P_2O_5. ha^{-1} (N_2×P_0). Regarding to the interaction between studied factors, Fateh variety show the highest value for NGS which was (42.65) at 60 kg N. ha^{-1} ×229.0 kg P_2O_5. ha^{-1} (N_1×P_2). No significant difference found between both varieties for this trait due to the effect of used N and P levels in this study. For 1000 GWT trait, Fateh variety obtained the highest weight which was (46.67g) at 120 kg N. ha^{-1} ×183.2 kg P_2O_5. ha^{-1} (N_2×P_1)), while th same variety recorded the lowest value which was (24.10 g) at 180 kg N. ha^{-1} ×Zero kg P_2O_5. ha^{-1} (N_3×P_0). These results indicate that phosphorus was more effective in the formation of the grains in Spike. The data in table (VII) also shows the superiority of Fateh variety than Rezgary in GYP, which gave the higher GYP (250.58g) at 60 kg N. ha^{-1} ×229.0 kg P_2O_5. ha^{-1} (N_1×P_2), while the same variety recorded the lowest GYP which was (123.89g) at Zero kg N. ha^{-1} ×Zero kg P_2O_5. ha^{-1} (N0×P0).

The data in table (VIII) reveals interaction between varieties, nitrogen and phosphorus on studied traits for the year 2009-2010. An interaction effect between studied factors on the P.H., show that Rezgary variety recorded highest value which was (91.067cm) at 60 kg N. ha^{-1} ×229.0 kg P_2O_5. ha^{-1} (N_1×P_2). While Fateh variety, recorded lowest value which was (63.833 cm) at Zero kg N. ha^{-1} × 229.0 kg P_2O_5. ha^{-1} (N_0×P_2). Depending in the interaction between varieties, N and P table (VIII), show significant differences between studied factors. For LA trait, the highest value recorded by Rezgary variety was (63.827cm^2) at level 60 kg N. ha^{-1} ×229.0 kg P_2O_5. ha^{-1} (N_1× P_2). While for Fateh variety was (64.293cm^2), at level Zero kg N. ha^{-1} × 229.0 kg P_2O_5. ha^{-1} (N_0×P_2) and the lowst value among both varieties was (31.047cm^2) recorded at level Zero kg N. ha^{-1} ×183.2 kg P_2O_5. ha^{-1} (N_0×P_1). Relying on NSP Fateh variety gave the highest value which was (6.367) at level 120 kg N. ha^{-1} × 2274.8 kg P_2O_5. ha^{-1} (N_2×P_3), when the lowest value for the same This may attributed to interaction effect of them on increasing number of the tillers per plant. Rezgary variety was superiority in NGS and gave maximum value which trait by the same variety was (3.433) obtained at level Zero kg N. ha^{-1} × 274.8 kg P_2O_5. ha^{-1} (N_0×P_3). These results appear that interaction effect between (N× P) was affective on increasing NSP. was (63.00) at level 60 kg N. ha^{-1} × 183.2 kg P_2O_5. ha^{-1} (N_1×P_1), when the same variety recorded the lowest value which was (25.80) at level Zero kg N. ha^{-1} × 183.2 kg P_2O_5. ha^{-1} (N_0× P_1).

Table.VII: Effect of interaction between varieties, nitrogen, phosphorous in studied traits of wheat grown in season 2008-2009.

Variety	N*	P**	p.H. (cm)	LA (cm^2)	NSP	NGS	1000 G W	GYP (g)
V1	N_0	P_0	94.33abc	40.69injg	4.36gf	33.87b	33.21de	178.15jkl
		P_1	93.40a-e	56.52cd	5.33cde	30.67b	33.98d	137.16t
		P_2	90.43a-k	42.41ing	4.40gf	40.40b	37.01c	161.25op
		P_3	88.16c-m	62.55bc	4.46gf	29.87b	38.23bc	174.95mlk
	N_1	P_0	89.50b-L	73.25a	6.20ab	36.56b	29.67hijg	212.57d
		P_1	92.20a-f	66.66ab	4.10gh	35.53b	37.17c	182.06kij
		P_2	92.23a-f	66.90ab	5.60cde	28.69b	39.43b	221.70c
		P_3	93.23a-f	44.00hg	5.66cde	36.67b	30.80gifh	184.76hij
	N_2	P_0	89.46b-k	34.85j	4.43gf	35.86b	30.01jgih	168.61mno
		P_1	89.20b	53.33efg	4.60f	31.07b	27.59ik	179.10klj
		P_2	95.06a-p	52.10def	5.26de	28.59b	26.14ml	151.33ro
		P_3	90.76fegd	64.19b	4.00ghi	34.59b	31.69gf	207.56de
	N_3	P_0	91.23fcegd	57.08cd	4.23hfg	30.10b	26.66i	149.89r
		P_1	93.56cebd	39.62ihjg	4.26gfh	36.97b	31.29gfh	158.02pg
		P_2	94.50cb	72.26a	5.70cd	35.63b	30.52hfig	211.95d
		P_3	101.06a	53.44def	4.26gfh	32.43b	32.02ef	169.58mn
V2	N_0	P_0	76.33p	54.01de	3.86hij	35.40b	31.06hfg	123.89u
		P_1	84.56kjl	42.40ihg	3.83hij	37.03b	30.36hfigi	187.74hi
		P_2	80.26nmo	56.66cd	5.43cde	37.97b	43.63a	221.54d
		P_3	79.36npmo	35.70ij	3.56ij	32.13b	26.32L	144.08rst
	N_1	P_0	84.26kjl	52.64def	6.20ab	38.07b	27.16L	230.05b
		P_1	76.86po	37.19jhi	3.53j	38.60b	30.96ghf	202.56ef
		P_2	81.60nml	51.89def	5.80bc	42.65a	29.17ij	250.58a
		P_3	82.86kjl	39.55gjhi	5.40cde	35.73b	30.84fig	214.74cd
	N_2	P_0	86.20kjl	36.94jhi	3.43cde	32.07b	30.25hijg	172.18mnl
		P_1	84.66kjl	35.57ji	3.46j	32.33b	26.67mn	166.29no
		P_2	79.56npmo	51.38def	6.36a	34.47b	31.24gfh	149.21rs
		P_3	84.60kjl	46.98grf	5.20e	35.47b	28.78jk	197.62gf
	N_3	P_0	81.76mnl	35.83ji	5.26de	39.50b	24.10h	141.64st
		P_1	76.40p	42.99gf	4.20gfh	34.73b	26.38L	181.94ikj
		P_2	86.90hji	51.19def	4.40gf	35.83b	24.24h	191.58gh
		P_3	79.20npo	40.88ihjg	4.26gfh	27.83b	26.06ml	127.78u

Means followed by different letters in the same column are significantly different from each other at P ≥0.05. N*= Nitrogen levels, P**= phosphorous level.

Table.VIII: Effect of interaction between varieties, nitrogen, phosphorous in studied traits of wheat grown in season 2009-2010.

Variety	N*	P**	p.H. (cm)	LA (cm^2)	NSP	NGS	1000 GW	GYP (g)
V1	N_0	P_0	82.600abcd	33.300q	4.500k	31.700 b	31.667j	180.957gi fh
		P_1	82.433abcd	44.870igh	5.100j	25.800 b	33.800jhi	144.567m
		P_2	79.967abcd	43.907i	5.800edfc g	31.900 b	36.200fged hi	166.817ij
		P_3	77.867abcd e	32.840q	4.167k	31.200 b	35.268fghi	169.817d
	N_1	P_0	84.467abcd	55.770c	6.033abcd e	38.900 b	38.183fbed c	213.810d
		P_1	88.333ab	35.827p	5.733edfg	63.000 a	36.768fged hi	187.800gf
		P_2	91.067a	63.827a	5.733edfg	35.400 b	37.368fged c	235.767c
		P_3	87.433abc	44.717hgi	4.533k	38.000 b	38.000fbed c	192.887ef
	N_2	P_0	81.867abcd	47.897f	4.200k	33.300 b	34.068gjhi	184.347gf h
		P_1	79.667abcd	45.767gh	5.667ehfg	28.100 b	36.067fged hi	178.657gi fh
		P_2	90.933a	36.897on	5.600hfg	26.800 b	33.668jhi	176.903gi h
		P_3	83.533abc	51.283e	6.133abcd	42.400 b	37.100fged h	214.080d
	N_3	P_0	78.867abcd	45.997g	6.100abcd	27.200 b	33.433ji	148.793k ml
		P_1	82.467abcd	43.443i	5.133ji	33.800 b	36.200fged hi	160.767kj
		P_2	90.600a	59.303b	6.267ab	41.100 b	36.000fgehi	213.563d
		P_3	75.233bcde	53.227d	5.733edfg	30.000 b	41.200ab	171.943ij h
V2	N_0	P_0	72.467cde	38.727ml	5.300hji	41.000 b	33.633hji	121.257n
		P_1	78.587abcd	31.047r	5.300hji	36.700 b	38.500fbed c	185.940gf h
		P_2	63.833e	64.293a	6.267ab	41.500 b	43.800a	205.170ed
		P_3	72.567dce	54.720dc	3.433l	34.600 b	38.067fbed c	152.227kl m
	N_1	P_0	78.000abcd	64.020a	5.933ebdf	44.800	36.000fgehi	239.550bc

		e		c	b		
	P_1	71.333ed	37.043on	5.867ebdfcg	38.900b	41.200ab	216.607cc
	P_2	69.700ed	54.493dc	4.400abc	41.700b	39.068bedc	259.653a
	P_3	75.267bcde	55.330c	4.200abc	39.900b	35.733fgehi	249.887ab
N_2	P_0	81.333abcd	41.167kj	4.167k	32.100b	39.500bdc	178.587gifh
	P_1	77.767abcde	44.167hi	5.933ebdfc	34.900b	31.368j	168.577ij
	P_2	73.000dce	35.563op	6.267ab	31.300b	33.600ji	158.473kjl
	P_3	78.3000abcde	54.307dc	6.367a	39.700b	31.400j	211.070d
N_3	P_0	76.100abcde	37.607mn	5.533hfig	36.900b	40.733abc	145.720ml
	P_1	70.700ed	39.907kl	5.300hji	36.200b	37.533fgedc	177.897gih
	P_2	79.033abcd	54.650dc	5.500hjig	42.400b	35.900fgehi	213.473d
	P_3	79.733abcd	41.620j	5.100j	31.100b	30.833j	130.820n

Means followed by different letters in the same column are significantly different from each other at P ≥0.05.

N*= Nitrogen levels, P**= phosphorous level.

When for 1000 GWT trait Fateh variety produced maximum value which was (43.800g) at level Zero kg N. ha^{-1} × 229.0 kg P_2O_5. ha^{-1} (N_0×P_2), but the minimum value for the same trait for the same variety was (30.833g) recorded at level 180 kg N. ha^{-1} × 274.8 kg P_2O_5. ha^{-1} (N_3× P_3). The data in table (VIII) show the highest value for GYP which was (259.653g), for Fateh variety obtained at interaction level 60 kg N. ha^{-1} × 229.0 kg P_2O_5. ha^{-1} (N_1×P_2), while the lowest value was (121.257g) which observed by the same variety at zero kg N. ha^{-1} ×zero kg P_2O_5. ha^{-1} (N_0×P_0). These results mean that this trait not affected by high levels of interaction between studied factors.

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