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RESPONSE OF MARIGOLD (*TAGETES ERECTA* L.) CV. DOUBLE EAGLE TO NITROGEN AND PHOSPHOROUS APPLICATION

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Abstract

This experiment was conducted to study the impact of adding different levels of nitrogen and phosphorus on growth and flowering of Marigold (*Tagetes erecta* L.) cv. Double Eagle. The study included addition of four levels of nitrogen 0, 100, 150 and 200 kg.ha^{-1} and four levels of phosphorus 0, 100, 150 and 200 kg.ha^{-1}, with a constant level of Potassium (100 kg.ha^{-1}) for each treatment. Full dose of phosphorous and potassium along with half dose of nitrogen was applied to the soil pots during the transplanting process. The remaining half dose of nitrogen was given at 30 days after transplanting. The results showed that each increase in the level of nitrogen have led to an increase in plant height and the content of N and P in leaves. Treatment with 150 kg.ha^{-1} of nitrogen was superior on increasing number of leaves, leaf area, number of branches, dry weight of shoots, number of flowers, early flowering, flower diameter, flower dry weight and vase life .Each increase in the level of phosphorous has led to an increase in plant height and the content of N and P in leaves. Treatment with 100 kg.ha^{-1} of phosphorous was superior on increasing number of leaves, leaf area, number of branches, dry weight of shoots, number of flowers, early flowering, flower diameter, flower dry weight and vase life .The interaction effect between nitrogen and phosphorus was significant in vegetative growth and flowering qualities, as was observed that with each increase in the level of nitrogen with a constant level of phosphorus, there was an increase in plant height and content of N and P in leaves. Treatment with combination 200:200 kg.ha^{-1} (N3P3) gave highest plants and an increase in content of N and P in leaves, while treatment with combination 150:100 kg.ha^{-1} (N2P1) was superior on increasing number of leaves, leaf area, number of branches, dry weight of shoots, number of flowers, early flowering, flower diameter, flower dry weight and vase life .

***Keywords*:** *Tagetes erecta* L., nitrogen, phosphorus, vegetative growth, flowering.

Introduction

Tagetes erecta L., a member of the family Asteraceae or Compositae, is a potential commercial flower that is gaining popularity on account of its easy culture, wide adaptability, and increasing demand in the subcontinent (Asif 2008). Despite its being native to the Americas, it is often called African marigold or marigold as common name. This plant reaches heights of between 50 and 100 cm (Kirtikar and Basu, 1987). Marigold is grown as an ornamental crop for its flowers, which are sold in the market as loose flowers in bulk, as specialty cut flowers, or for making garlands. It is also one of the most important natural sources of xanthophylls for use as natural food additive to brighten egg yolks and poultry skin (Bosma *et al*., 2003). Moreover, it is also being used effectively to dye fabrics commercially, where its ethanol-based flower extracts produce different colors on fabrics (Vankar *et al*., 2009). Today, *Tagetes erecta* is grown to extract lutein, a common yellow/orange food color (Rosa Martha *et al*., 2006).

Nutrition plays an essential role in the improvement of vegetative growth and flower yield of annual flowering crops as in others. They are known to respond well to the application of nutrients. Proper supply of nutrients particularly that of major ones influence not only crop growth, but also yield and quality are largely dependent upon it. However, the individual effect of any of these nutrients cannot be a comprehensive result of its own. Their individual effects are always mutually influenced by the dosages of the others and hence, have to be studied in combination. This fact is true with all essential elements, even though some of them are generally required in lesser quantities (Pimple *et al*., 2006). Many studies have pointed to the role of nitrogen and phosphorus in improving vegetative growth and flowering for many ornamental plants. Acharya and Dashora (2004) reported that application of 200 kg.ha^{-1} each of nitrogen and phosphorus produced the maximum height of plant and the largest number of branches, earlier flowers with maximum diameter. The maximum number of flowers was recorded with 150 kg.ha^{-1} N and 200 kg.ha^{-1} P in African marigold cv. Pusa Basanti Gainda. Baboo *et al*. (2005) observed that the tallest plants with maximum number of leaves, diameter and spread were produced by the plants receiving 300 kg.ha^{-1} N and 200 kg.ha^{-1} P_2O_5 in African marigold. Application of N at 300 kg.ha^{-1} recorded the highest length of flower stalk, number of flowers per plant, size of flower head, weight flowers per plant and flower yield per ha. All these parameters except stalk length were on par with those recorded at 200 kg.ha^{-1} N. Application of Phosphorus at 200 kg.ha^{-1} recorded the highest values of number of flowers per plant, size of flower head, weight of flowers per plant and flower yield per ha. Application of nitrogen at 200 kg.ha^{-1} and 100 kg.ha^{-1} P_2O_5 produced maximum plant height, number of branches (primary and secondary branches) per plant, plant spread and number of leaves per plant, in addition to a significant increase in fresh and dry weight of flowers, flowering duration, number of flowers per plant and harvest flowers (Sharma *et al*., 2006).

Materials and Methods

This experiment was carried out in the lath house at the Horticulture and Landscaping Department, College of Agriculture, University of Diyala, during the season 2017-2018, Marigold seeds (*Tagetes erecta* L.) cv. Double Eagle which obtained from local market were planted in 10/3/2017, the seedlings were transferred to 25 cm pots contained 5 kg of sandy loam soil after two months, table (1) shows some of the physical and chemical characteristics of the culture soil. The study included addition of four levels of nitrogen supplier of urea (N 46%) which is N0 (0 kg.ha^{-1}), N1 (100 kg.ha^{-1}), N2 (150 kg.ha^{-1}) and N3 (200 kg.ha^{-1}), and addition of four levels of phosphorus supplier of mono superphosphate (P_2O_5 18%) which is P0 (0 kg.ha^{-1}), P1 (100 kg.ha^{-1}), P2 (150 kg.ha^{-1}) and P3 (200 kg.ha^{-1}), with a constant level of potassium (100 kg.ha^{-1}) for each treatment. The amount of fertilizer has been weighted according to each combination of the treatments mentioned above. Full dose of phosphorous and potassium along with half dose of nitrogen was applied to the soil pots during the process of transplanting. The remaining half dose of nitrogen was given at 30 days after transplanting.

The Experiment measures had been taken at the full bloom stage. It included the vegetative growth qualities like plant height, number of leaves per plant, number of branches (main and secondary branches) per plant, leaf area per plant, dry weight of shoots, content of nitrogen and phosphorus in leaves, and flowering growth qualities like number of flowers per plant, date of flowering, flower diameter, flower dry weight and vase life. To determine the content of nitrogen and phosphorus in the leaves, samples of leaves was collected at the beginning of flowering and the amount of nitrogen was measured by Microkjeldahl as described by Tandon (1993), and phosphorus by spectrophotometer using a standard curve (AOAC, 1984).

Table 1 : Some of the physical and chemical characteristics of the culture soil.

The character	The value	The unit
pH	7.20	--
EC	3.83	dS.m^{-1}
Available N	41	mg.kg^{-1}
Available P	52	mg.kg^{-1}
Available K	211	mg.kg^{-1}
Organic matter	2.50	%
Soil Separation		
Sand	630	g.kg^{-1}
Clay	280	g.kg^{-1}
Silt	46	g.kg^{-1}
Soil structure	**Sandy Loam**	

Table 2 : Number of treatments, their symbols and fertilizer combination.

Number of treatments	Fertilizer combination	Symbols	Unit
1	0: 0: 100	N0 P0 K	Kg.ha^{-1}
2	0: 100: 100	N0 P1 K	
3	0: 150: 100	N0 P2 K	
4	0: 200: 100	N0 P3 K	
5	100: 0: 100	N1 P0 K	
6	100: 100: 100	N1 P1 K	
7	100: 150: 100	N1 P2 K	
8	100: 200: 100	N1 P3 K	
9	150: 0: 100	N2 P0 K	
10	150: 100: 100	N2 P1 K	
11	150: 150: 100	N2 P2 K	
12	150: 200: 100	N2 P3 K	
13	200: 0: 100	N3 P0 K	
14	200: 100: 100	N3 P1 K	
15	200: 150: 100	N3 P2 K	
16	200: 200: 100	N3 P3 K	

The experiment had been conducted as a factorial 4×4 on the RCBD design with three replicates and six pots for each one; table (2) shows the number of treatments, their symbols and fertilizer combination used in the experiment. The data were analyzed according to the statistical program SAS (2003). Means were compared using the Less Significant Difference (LSD) test (P≤0.05).

Results

Effect of nitrogen, phosphorus, and their interaction in vegetative growth qualities of Marigold *(Tagetes erecta* L.*)* cv. Double Eagle.

The data on various growth parameters, i.e. plant height, number of leaves, leaf area, number of branches, and dry weight of shoots, nitrogen and phosphorus content in leaves are tabulated in table 3-6. Each increase in the level of nitrogen and phosphorus has led to an increase in plant height. Significant differences existed in the plant height due to nitrogen, phosphorus as well as their interaction. Maximum plant height was recorded by N3 (93.78 cm), P3 (91.81 cm) and N3P3 (99.19 cm). N3 was on par with N2 with a plant height of 91.68 cm, but significantly superior to N1 and N0. Also P3 was on par with P2 which recorded a plant height of 89.80 cm, but significantly superior to P1 and P0. Among the interactions, N3P3 was on par with the treatment combinations of N3P2 and N2P3 N2P2, N1P3 and significantly superior to the rest of the combinations.

Table 3 : Effect of nitrogen, phosphorus, and their interaction in plant height and number of leaves per plant of *Zinnia elegans* var. Benary's Giant Mix.

Treatment	Plant height (cm)					Number of leaves				
	P0	P1	P2	P3	Mean	P0	P1	P2	P3	Mean
N0	66.00	72.38	75.55	77.33	72.82	142.61	165.06	153.96	164.59	156.55
N1	80.70	88.04	91.68	93.73	88.54	179.52	190.58	170.99	187.23	182.08
N2	83.64	91.17	94.91	97.01	91.68	196.04	206.18	191.12	189.23	195.64
N3	85.60	93.26	97.06	99.19	93.78	189.36	204.66	182.45	195.90	193.09
Mean	78.99	86.21	89.80	91.81	86.71	176.88	191.62	174.63	184.24	181.84
L.S.D 0.05										
N	3.06					4.19				
P	2.90					3.96				
N×P	5.71					7.41				

There were significant differences with respect to number of leaves per plant due to nitrogen, phosphorus as well as their interaction. Maximum number of leaves was recorded by N2 (195.64), P1 (191.62) and N2P1 (206.18). N2 was on par with N3 having 204.09 leaves per plant, but significantly superior to N1 and N0. P1 was significantly superior to the rest of the treatments. Among the interactions, N2P1 was on par with the treatment combination N3P1 (204.66 leaves per plant) but significantly superior to the rest of the combinations.

The effect of nitrogen, phosphorus levels as well as their interaction was found to be significant on leaf area per plant. Maximum leaf area was recorded by N2 (3079.6 cm^2), P1 (3087.0 cm^2) and N2P1 (3270.0 cm^2). N2 significantly superior to the rest of the treatments, and minimum leaf area per plant (2749.7 cm^2) being recorded by N0. P1 was significantly superior to the rest of the treatments. Among the interactions, the treatment combination N2P1 was significantly superior to N3P1 (3168.9 cm^2) and the rest of combinations.

There were significant differences on number of branches per plant due to nitrogen, phosphorus as well as their interaction. Maximum number of branches was recorded by N2 (36.58), P1 (36.30) and N2P1 (39.28). N2 was significantly superior to the rest of the treatments. P1 was significantly superior to the rest of the treatments. Among the interactions, N2P1 was on par with the treatment combination N2P2 (38.09 branches per plant) but significantly superior to the rest of the combinations.

Table 4 : Effect of nitrogen, phosphorus, and their interaction in leaf area and number of branches per plant of Marigold *(Tagetes erecta* L.*)* cv. Double Eagle.

Treatment	Leaf area (cm^2)					Number of branches				
	P0	P1	P2	P3	Mean	P0	P1	P2	P3	Mean
N0	2642.1	2833.1	2723.7	2799.9	2749.7	22.65	30.00	20.99	23.95	24.40
N1	2806.5	3076.1	2874.6	2950.5	2926.9	28.92	33.28	27.33	29.90	29.86
N2	2988.2	3270.0	3047.1	3012.9	3079.6	32.92	39.28	38.09	36.01	36.58
N3	2934.9	3168.9	2863.8	2948.3	2979.0	34.23	38.66	31.05	32.61	34.14
Mean	2842.9	3087.0	2877.3	2927.9	2933.8	29.68	36.30	29.36	30.62	33.23
L.S.D 0.05										
N	37.88					1.57				
P	37.72					1.42				
N×P	66.78					2.29				

The results showed that the effect of nitrogen, phosphorus levels as well as their interaction was found to be significant on the dry weight of shoots. Largest dry weight was recorded by N2 (36.60 g), P1 (36.33 g) and N2P1 (38.73 g). N2 was significantly superior to the rest of the treatments. P1 was significantly superior to the rest of the treatments. Among the interactions, the treatment combination N2P1 was significantly superior to the rest of combinations, Fig. 1.

Table 5 : Effect of nitrogen, phosphorus, and their interaction in Dry weight of shoots (g) of Marigold *(Tagetes erecta* L.*)* cv. Double Eagle.

Treatment	Dry weight of shoots (g)				
	P0	P1	P2	P3	Mean
N0	30.36	32.95	31.09	32.42	21.71
N1	33.30	36.04	33.28	34.60	34.31
N2	35.78	38.73	35.91	35.98	36.60
N3	35.46	37.61	33.56	34.84	35.37
Mean	33.71	36.33	33.46	34.46	34.49
L.S.D 0.05					
N	0.51				
P	0.46				
N×P	0.93				

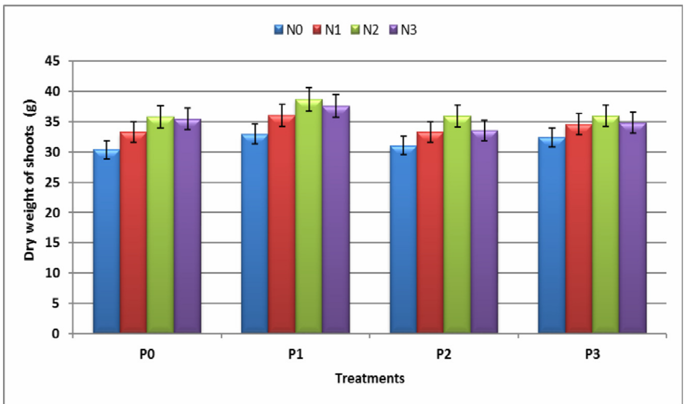

Fig. 1 : Effect of nitrogen, phosphorus, and their interaction in dry weight of shoots of Marigold *(Tagetes erecta* L.*)* cv. Double Eagle.

Nitrogen content differed significantly by varying the doses of nitrogen, phosphorus and their interactions in the leaves. Maximum content of nitrogen in leaf was recorded by the treatment of N3 (3.91%), P3 (3.34%) and N3P3 (4.01%). N3 was followed by N2 (3.83%) and minimum nitrogen content in the leaves (2.23%) being recorded by N0. P3 was significantly superior to the rest of the treatments. Among the interactions, the treatment combination N3P3 was significantly superior to the rest of combinations.

There were significant differences in phosphorus content among the various doses of nitrogen, phosphorus and their interactions in the leaves. Maximum content of phosphorus in leaf was observed by the treatment of N3 (0.48%), P3 (0.42%) and by the combination N3P3 (0.51%). N3 level was on par with N2 (0.48%). The combination

N3P3 was on par with lower levels till N3P1 (0.49%) but significantly superior to still lower doses.

Effect of nitrogen, phosphorus, and their interaction in flowering growth qualities of Marigold *(Tagetes erecta* L.) cv. Double Eagle.

The results on various flowering parameters i.e. number of flowers per plant, flowering date, flower diameter, dry weight of flower, and the vase life are tabulated in table 7-9.

The effect of different levels of nitrogen, phosphorus and their interactions was found to be significant on number of flowers per plant. N2 level recorded the highest number of flowers per plant (37.52) which was significantly superior to N3 (31.14) and the rest of the treatments whereas, among phosphorus doses, P1 level was the best with 37.13 flowers per plant. Among the interactions, the treatment combination of N2P1 recorded the highest number of flowers per plant (44.31) and significantly superior to the rest of combinations.

Flowering date was varied significantly among the different levels of nitrogen, phosphorus and their interactions. N2 level took the least number of days for flowering date (61.83 days) which was significantly earlier to N3 (64.33 days) whereas, among phosphorus doses, P1 level was the earliest (61.92 days) for flowering date. Among the interactions, the treatment combination of N2P1 (61.00 days) was the earliest for flowering date. N2P1 was on par with the treatment combinations of N1P1 and N2P2 and significantly superior to the rest of the combinations.

There were significant differences in the flower diameter values among the different levels of nitrogen, phosphorus and their interactions. The largest flowers were obtained by the treatments N2 (8.50 cm), P1 (8.33 cm) and their combination N2P1 (9.24 cm). N2 was significantly superior to the rest of the treatments. P1 was significantly superior to the rest of the treatments. Among the interactions, the treatment combination N2P1 was significantly superior to the rest of combinations.

The results showed that the effect of nitrogen, phosphorus levels as well as their interaction was found to be significant on the dry weight of the flower. Largest dry weight was recorded by N2 (4.38 g), P1 (4.35 g) and N2P1 (4.95 g). N2 was significantly superior to the rest of the treatments. P1 was significantly superior to the rest of the treatments. Among the interactions, the treatment combination N2P1 was significantly superior to the rest of combinations.

The effect of nitrogen and phosphorus levels and their interactions was found to be significant on vase life of Marigold flowers. The highest vase life was recorded by N2 (9.63 days), P1 (9.23 days) and N2P1 combination (10.95 days), fig. 2.

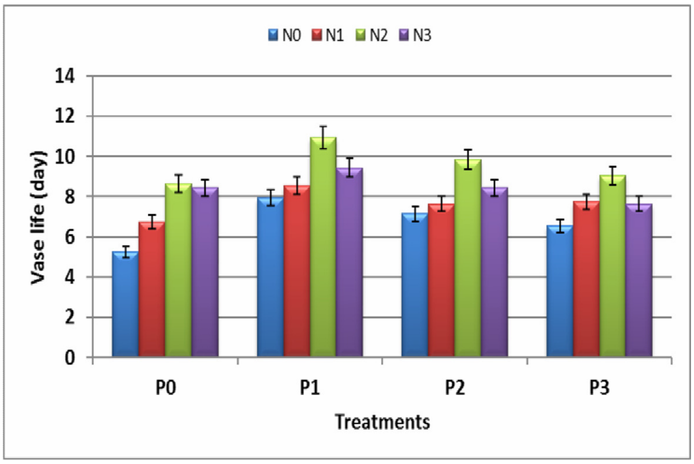

Fig. 2 : Effect of nitrogen, phosphorus, and their interaction in vase life of Marigold *(Tagetes erecta* L.*)* cv. Double Eagle.

Table 6 : Effect of nitrogen, phosphorus, and their interaction in Content of nitrogen and phosphorus in leaves of Marigold *(Tagetes erecta* L.*)* cv. Double Eagle.

Treatment	Content of nitrogen in leaves (%)					Content of phosphorus in leaves (%)				
	P0	P1	P2	P3	Mean	P0	P1	P2	P3	Mean
N0	1.97	2.15	2.31	2.48	2.23	0.26	0.26	0.28	0.32	0.28
N1	2.54	2.73	2.82	2.87	2.74	0.31	0.35	0.36	0.36	0.35
N2	3.57	3.84	3.92	3.99	3.83	0.45	0.48	0.49	0.50	0.48
N3	3.75	3.94	3.96	4.01	3.91	0.47	0.49	0.50	0.51	0.49
Mean	2.96	3.17	3.25	3.34	3.18	0.37	0.40	0.41	0.42	0.40
L.S.D 0.05										
N	0.30					0.11				
P	0.11					0.04				
N×P	0.60					0.21				

Table 7 : Effect of nitrogen, phosphorus, and their interaction in number of flowers per plant and flowering date of Marigold *(Tagetes erecta* L.*)* cv. Double Eagle.

Treatment	number of flowers per plant					flowering date (day)				
	P0	P1	P2	P3	Mean	P0	P1	P2	P3	Mean
N0	19.39	30.03	25.13	23.90	24.61	63.67	62.00	62.33	64.33	63.08
N1	23.94	35.60	29.72	29.25	29.63	63.33	61.33	61.67	62.67	62.35
N2	32.67	44.31	30.27	32.84	37.52	62.33	61.00	61.33	62.67	61.83
N3	28.25	38.59	29.39	28.35	31.14	64.67	63.33	64.00	65.33	64.33
Mean	26.06	37.13	31.13	28.58	30.73	63.50	61.92	62.43	63.75	62.90
L.S.D 0.05										
N	1.42					0.29				
P	1.33					0.23				
N×P	2.69					0.41				

Table 8 : Effect of nitrogen, phosphorus, and their interaction in flower diameter and dry weight of flower of Marigold *(Tagetes erecta* L.*)* cv. Double Eagle.

Treatment	flower diameter (cm)					dry weight of flower (g)				
	P0	P1	P2	P3	Mean	P0	P1	P2	P3	Mean
N0	6.70	7.58	7.18	6.89	7.09	2.87	3.76	3.35	3.25	3.31
N1	7.55	8.32	7.85	7.56	7.82	3.25	4.22	3.73	3.69	3.72
N2	7.83	9.24	8.70	8.24	8.50	3.98	4.95	4.61	3.99	4.38
N3	8.29	8.20	7.74	7.41	7.91	3.61	4.47	3.70	3.62	3.85
Mean	7.59	8.33	7.87	7.53	7.83	3.43	4.35	3.85	3.64	3.82
L.S.D 0.05										
N	0.14					0.10				
P	0.11					0.09				
N×P	0.27					0.16				

Table 9 : Effect of nitrogen, phosphorus, and their interaction in vase life (day) of Marigold *(Tagetes erecta* L.*)* cv. Double Eagle.

Treatment	vase life (day)				
	P0	P1	P2	P3	Mean
N0	5.25	7.95	7.15	6.55	6.73
N1	6.75	8.55	7.65	7.75	7.68
N2	8.65	10.95	9.85	9.05	9.63
N3	8.45	9.45	8.45	7.65	8.50
Mean	7.28	9.23	8.28	7.75	8.14
L.S.D 0.05					
N	0.21				
P	0.20				
N×P	0.57				

Discussion

The results show that each increase in nitrogen level has led to an increase in plant height and the content of N and P in the leaves. The highest increase in number of leaves per plant, number of branches per plant, leaf area, and dry weight of shoots have been recorded at the nitrogen level of 150 kg.ha^{-1}, However, a decrease in these qualities have been observed when increasing the dose of nitrogen for this level. The downward trend in the number of branches per plant when increasing the nitrogen level for a certain level is consistent with what Hugar (1997) found in *Gaillardia pulchella*, while the trend towards low dry weight when increasing the nitrogen level for a certain level is consistent with what Sonawane (2008) found in China aster plants. The increase in plant height, number of branches per plant, and leaf area may be due to the availability of these key nutrients, which lead to better growth due to increased cell division and elongation and therefore increase the efficiency of photosynthesis process (Verma *et al*., 2011). The increase in the number of leaves per plant may return to the increase in plant height and number of branches (Table 3) and this increase will lead to more production of vegetative buds and eventually more leaves. On the other hand, the number of leaves in the control plants was a little, which may be due to the absence of nitrogen, which is working on the development of vegetative buds (Javid *et al*., 2005). When nitrogen level increase, the nutrient uptake increases also contributing to the increase in photosynthesis process and increase cellular materials represented in the leaves, and the increasing number of leaves improves the size of photosynthesis tissue, leading to accelerating the growth of the main stem and increase the number of branches which contributes to increase the number of flowers per plant (Belorker *et al*., 1992).

The decrease in the number of flowers per plant when increasing the level of nitrogen more from 150 kg.ha^{-1} may be due to stimulate the dominance of terminal bud growth without allowing axillary buds to produce side branches (Pimple *et al*., 2006). The maximum vase life of flowers was recorded in flowers produced from plants treated with 150 kg.ha^{-1} of nitrogen and can be attributed to dry weight increase of the flower at this level (table 4), so the such flowers can remain fresh for a longer time and this is consistent with what Monish *et al*. (2008) found in China aster plants.

It was noted that each increase in the level of phosphorus has led to an increase in plant height, but the highest increase in number of leaves per plant and number of branches per plant have been recorded in plants receiving 100 kg.ha^{-1} of phosphorus, a decrease was observed in the qualities listed above when increasing the level of phosphorus for more of this level. This trend in lower growth at increasing the level of phosphorus for a certain level is consistent with what Hugar (1997) found in *Gaillardia pulchella* plants. Phosphorus level of 100 kg.ha^{-1} caused significant increase in leaf area and this increase may be due to the role of phosphorus to supply the plant with energy in the form of ATP in the stages of photosynthesis process and thus increase their efficiency (Mullen, 2013). Increase the number of flowers per plant as a result of treatment with phosphorus may be due to the role of phosphorus in the formation of ATP compounds, which used in most of the energy processes in the plant such as nutrient uptake and photosynthesis and thus increase the assimilation materials and converts to the production of flowers (Alkurdi, 2014).

The effect of interaction between nitrogen and phosphorus was significant in vegetative growth qualities, as was observed that with each increase in the level of nitrogen with a constant level of phosphorus there was an increase in plant height, also a similar effect observed for phosphorus. The highest number of leaves, branches, leaf area and dry weight of shoots recorded at the combination 150:100 $kg.ha^{-1}$ (N2P1), followed by combinations 200:100 $kg.ha^{-1}$ (N3P1) and 150:150 $kg.ha^{-1}$ (N2P2). Increase in leaf area may be due to the role of nitrogen to assist in increase vegetative growth by increasing the size of the leaf and the cells and eventually increase leaf area. Also, the availability of nitrogen and phosphorus in this combination may have been led to the best growth of roots and increased their physiological activity to absorb water and other nutrients (Hadimani, 2003). The effect of interaction between nitrogen and phosphorus was significant in flowering growth qualities, as plants treated with 150:100 $kg.ha^{-1}$ (N2P1) led to improve all floral qualities. Increase the number of flowers per plant and flower diameter as a result of addition of nitrogen and phosphorus may be due to that these elements have led to increase in plant height, number of leaves, number of branches and leaf area (table 4), and thus enhance the photosynthetic material which lead to increase the number of flowers and the formation of large flowers. The early flowering may be due to the early time of the completion of vegetative growth as a result of balanced nutrition and also provide enough food to produce flowers earlier (Sajid and Amin, 2014). The addition of nitrogen and phosphorus were encouraged to improve the vegetative growth primarily, which led to more of carbohydrates and proteins available, which may be reflected later in improving the floral qualities. In addition, these nutrients can stimulate growth by stimulating cell division and synthesis of organic food (Taha, 2012). Results of this study show that the best vegetative growth and floral qualities of Marigold (*Tagetes erecta* L.) cv. Double Eagle was achieved when adding nitrogen and phosphorus at the combination of 150:100 $kg.ha^{-1}$ (N2P1).

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