EVALUATION OF PHOSPHORUS AND URTICA ON GROWTH AND YIELD OF FOUR CULTIVARS PEA (*PISUM SATIVUM L.*)

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ABSTRACT

This study was carried out at the vegetable research farm, College of Agricultural Engineering Sciences, Dohuk University during two growing seasons on the period from 15th November 2021to 1st May 2022 and 15th November 2022 to 1st May 2023, to study the effect of two levels of phosphorus (0 and 36 kg.ha^{-1}) and three levels of Urtica extract (0, 3 and 6 g.l^{-1}) on four cultivars of pea (Mammoth, Mezza Rama, Kaspa and Javor). The results showed that the Mammoth cv. significantly enhanced plant height (cm) and number of pods.plant^{-1} during both seasons, while Meza Rama cv. significantly enhanced chlorophyll%, weight of pod (g), length of pod (cm), width of pod (cm), number of seeds.pod^{-1}, total yield (g.plant^{-1}) and total yield (t.ha^{-1}) at both study seasons. The application of 36 kg.ha^{-1} phosphorus caused a significant increase for the all studied parameters. In the same time the increased Urtica concentrations caused significantly increased all studies parameters at the first and second seasons except weight of pod (g), length of pod (cm) and width of pod (cm) in the second season. The dual interaction between two factors (cultivars and phosphorus), cultivars and Urtica) and (phosphorus and Urtica) significantly enhanced all parameters at both seasons. Also the triple interaction among three factors caused a significant effect for the all of the studied parameters compared control.

Keywords: pea, fertilizers, plant extract, verities

تاثير الفسفور والقريص على نمو وحاصل اربعة اصناف من البزاليا (*Pisum sativum L*.)

غربت حسن محمد

استاذ

المستخلص

اجريت هذه التجربة في حقل الخضراوات التابع لكلية علوم الهندسة الزراعية/ جامعة دهوك خلال موسمين من 15 تشرين الثانى2021 حتى 1 من مارس 2022 و 15 تشرين الثانى 2022 حتى 1 من مارس 2023 لدراسة تاثير تراكيزين من الفسفور (0، 36 كغم/هكتار) و ثلاث تراكيز من مستخلص القريص (0، 3، 6 غم/لتر) على اربعة اصناف من البزاليا (ماموث، ميزا راما، كاسبا، جافور). وقد اظهرت النتائج ان الصنف ماموث زاد معنويا من ارتفاع النبات (سم) وعدد القرنات انبات في حين ان الصنف ميزا راما زادت معنويا من نسبة الكلوروفيل و وزن القرنة (غم) و طول القرنة (سم) و عرض القرنة (سم) و عدد البذور/ قرنة و الحاصل الكلي (غم/نبات) والحاصل الكلي (طن/هكتار) خلا ل الموسم الاول والثاني. استخدام 36 كغم/هكتار من الفسفور تسبب في زيادة معنوية لكل الصفات المدروسة وخلال الموسمين من النمو. وفي نفس الوقت تسبب زيادة تركيز القريص في زيادة معنوية لجميع الصفات و خلال موسمين ماعدا وزن القرنة (غم) وطول القرنة (سم) وعرض القرنة (سم) في الموسم الثاني. التداخل الثنائي بين العاملين (الصنف والفسفور) و(الصنف والقريص) و (الفسفور والقريص) زادت معويا جميع الصفات المدروسة في الموسم الاول والموسم الثاني. ايضا التداخل الثلاثي بين العوامل الثلاثة تسبب في تاثير معنوى لجميع الصفات المدروسة مقارنة مع معاملة المقارنة.

الكلمات المفتاحية: البزاليا والاسمدة ومستخلص النبات والاصناف

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INTRODUCTION

Pea (*Pisum sativum* L.)is the second-most significant grain legume in the world, a cool-season crop grown in more than 85 nations (17). Peas are widely grown because of their high yield potential, outstanding biological characteristics, and importance for human and animal nutrition. Pea seeds have a high nutritional content, are simple to digest, and are a good source of protein, carbs, phosphorus, vitamins A and B, iron, and calcium (10). It is recognized as one of the valuable crops for organic farming because of its short growing season and capacity for N2 fixation (18). A cultivar responds differently to diverse agroclimatic conditions, and even when cultivated in the same climate, different cultivars of the same species frequently provide varying yields. Crop yield and quality are extremely complicated traits that depend on specific biological interactions between the environment and genetics. According to the local environmental circumstances, cultivar features and combinations of attributes vary (8). Demonstrated that broad bean cultivars varied in all features that had been examined, including yield parameters (11). One of the most crucial components that have a considerable impact on plant growth and metabolism is phosphorus. The availability of phosphorus restricts agricultural production on more than 30% of all arable land in the world (21). Legumes have a high need for phosphorus, which is consistent with phosphorus role in the rapid rates of energy transfer required in the nodule. Furthermore, because it is essential for the storage and transfer of energy required for metabolic activities, phosphorus has an enhancing effect on plant growth and biological yield (15). Ibrahim and Hala Kandil (7) discovered a positive effect on plant height, ear length, and grain yield when phosphorus was increased from 15.5 to 22.75 or 30 kg P2O5 fed^{-1}. According to Hala Kandil *et al*. (6), 150 Kg fed^{-1} of phosphorus resulted in the highest number of pods per plant and length of pods in two common bean kinds. Observed that the growth and yield parameters were significantly increased by increasing phosphorus levels from 40, 80 to 120 $kg.ha^{-1}$ (9). Urtica use in agriculture has been discovered to provide a variety of advantages. Regarding the production and vegetative parameters, Urtica extract fertilization poured into the soil was equal to foliar fertilization (12). The flowering plant Urtica is regarded as a weed due to its capacity to cover the soil and develop quickly. It might be beneficial for heavily phosphate- and nitrogen-fertilized soils (22). But Urtica extract is a good source of calcium, phosphorus, nitrogen, phenolic compounds, antioxidants, and chlorophyll (16). It also contains plenty of the vitamins A, B, C, E, and K. The minerals and other components found in Urtica L. extract may contribute to better growth and development by promoting nutrient availability and absorption (13). In order to improve the nutritional value, growth, and development of plants, innovative botanical extracts may be utilized as biostimulants of plant growth, according to Godlewska *et al*. (4).The present study was therefore, mainly envisaged to evaluate the suitable cultivars with high yield, also application phosphorus and Urtica to enhance the vegetative and yield parameters of pea plant.

MATERIALS AND METHODS

The experiment was conducted at the vegetable research farm, college of Agricultural engineering sciences, University of Duhok during the two growing seasons of 2021-2022 and 2022-2023 to study the effect of phosphorus and Urtica on growth and yield of four pea cultivars. The experiment included three factors, the first was four cultivars of pea (Mammoth, Mezza Rama, Kaspa and Javor) the second factor was two concentrations of phosphorus (0 and 36 $kg.ha^{-1}$) the third factor was three concentrations of Urtica (0, 3 and 6 $g.l^{-1}$). Phosphorus was added during sowing of seeds, Urtica spraying were applied three times with in fifteen days intervals, starting at the stage three to four true leaves This study consisted of 24 treatments (four cultivars, two concentrations of phosphorus and three concentrations of Urtica). The land was plowed and it was soften, the it was divided into lines and seeds were sowed at a distance 30 cm between plant and 60 cm between lines on December, 15th, the previous treatments were arranged in three replications using Randomized Complete Block Design (RCBD).

Data were analyzed statistically by using SAS program (19). The collected data subjected to analysis variance and means separated through Duncan Multiple Ranged Test at the alpha level of 5%. Experimental measurements were as follows: vegetative parameters including: plant height (cm), number of branches.plant^{-1} and chlorophyll%. Yield parameters including: number of pods.plant^{-1}, pod weight (g), length of pod (cm), width of pod (cm), number of seeds.pod^{-1}, total yield (g.plant^{-1}) and total yield (t.ha^{-1}).

RESULTS AND DISCUSSION

Data in table (1) observed that the mammoth cv. gave the highest plant height at both seasons (97.67 cm in first season and 111.00 cm in second season) compared to other cultivars. Application phosphorus in both studies season significantly increased plant height (91.19 and 107.01 cm) respectively. The plant height reached to (91.00 in first season and 107.50 in second season cm) when spray with 6 mg.l^{-1} of Urtica compared with control which gave (82.83 in first season and 99.46 cm in second season). The interaction between cultivars and phosphorus was significant effect at both seasons, the maximum value (101.11 and 112.33 cm) respectively was observed between mammoth cv. and 36 kg.ha^{-1} phosphorus. The interaction between mammoth cv. and 6 g.l^{-1} Urtica gave the highest significant value (101.33 in 2021-2022 and 116.67 cm in 2022-2023). The largest plant height (94.42 in first season and 111.50 cm in second season) was noticed between 36kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica. The triple interaction among cultivars, phosphorus and urtica caused significant effect during two study seasons in this parameter and the highest plant height reached to (102.67 in first season and 118.00 cm in second season) for the treatment (mammoth cv., 36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica) compared with the least plant height (59.67 in first season and 85.00 cm in second season) for the treatment (Javor cv., 0 kg.ha^{-1} phosphorus and 0 g.l^{-1} urtica).

Table 1. Effect of phosphorus, urtica and their interaction on plant height (cm) of four cultivars pea plant.

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022)					Second season (2022-2023)				
		Urtica (g.l^{-1})			cv.*P	Mean effect of cv.	Urtica (g.l^{-1})			cv.*P	Mean effect of cv.
		0	3	6			0	3	6		
Mammoth	0	89.33 c-e	93.33 b-d	100.00 ab	94.22 b	97.67 a	102.33 c-e	111.33 a-c	115.33 ab	109.67 a	111.00 a
	36	99.33 ab	101.33 ab	102.67 a	101.11 a		111.33 a-c	107.67 a-d	118.00 a	112.33 a	
Mezza Rama	0	78.00 g-i	79.00 g-i	80.00 f-i	79.00 d	81.94 b	95.67 d-f	99.67 c-e	98.33 c-e	97.89 cd	102.39 b
	36	83.00 e-h	85.00 d-g	86.67 d-g	84.89 c		104.33 b-e	105.00 b-e	111.33 a-c	106.89 ab	
Kaspa	0	89.33 c-e	93.00 b-d	97.00 a-c	93.11 b	95.94 a	93.67 ef	100.67 c-e	104.33 b-e	99.56 c	103.78 b
	36	97.00 a-c	99.00 ab	100.33 ab	98.78 a		106.00 a-e	107.33 a-d	110.67 a-c	108.00 a	
Javor	0	59.67 k	74.67 h-j	73.33 ij	69.22 e	74.61 c	85.00 f	96.00 d-f	96.00 d-f	92.33 d	96.58 c
	36	67.00 jk	85.00 d-g	88.00 d-f	80.00 d		97.33 de	99.17 c-e	106.00 a-e	100.83 bc	
cv.*U.	Mam.	94.33 b	97.33 ab	101.33 a	Mean effect of Phosphorus		106.83 bc	109.50 ab	116.67 a	Mean effect of Phosphorus	
	Me. Ra.	80.50 c	82.00 c	83.33 c			100.00 cd	102.33 b-d	104.83 b-d		
	Ka.	93.17 b	96.00 ab	98.67 ab			99.83 cd	104.00 b-d	107.50 bc		
	Ja.	63.33 d	79.83 c	80.67 c			91.17 e	97.58 de	101.00 b-d		
P*U.	0	79.08 c	85.00 b	87.58 b	83.89 b		94.17 c	101.92 b	103.50 b	99.86 b	
	36	86.58 b	92.58 a	94.42 a	91.19 a		104.75 b	104.79 b	111.50 a	107.01 a	
Mean effect of Urtica		82.83 b	88.79 a	91.00 a			99.46 c	103.35 b	107.50 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level

The result in table (2) showed that the Javor cv. significantly enhanced the number of branches.plant^{-1} during two growing seasons (9.51 and 11.12) respectively compared with other cultivars. The highest number of branches.plant^{-1} reached to (9.26 in first season and 10 78 in second season) when using 36 kg.ha^{-1} of phosphorus compare with control which gave (7.79 and 9.39) respectively. Spray urtica at concentration 6 g.l^{-1} significantly enhanced number of branches.plant^{-1} (9.22 in the first season and 10.77 in the second season). The interaction between Javor cv. and 36 kg.ha-1 at both seasons gave the maximum significant value (10.08 and 11.72) respectively. The interaction between Javor cv. and 6 g.l^{-1} Urtica also significantly enhanced number of branches.plant^{-1} (10.28 in first season and 11.67 in the second season). The interaction between phosphorus and urtica was significant effect, the highest value (9.85 and 11.59) was noticed between 36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica during both study seasons.

Table 2. Effect of phosphorus, Urtica and their interaction on number of branches.plant^{-1} of four cultivars pea plant

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022)					Second season (2022-2023)				
		Urtica (g.l^{-1})			cv.*P	Mean effect of cv.	Urtica (g.l^{-1})			cv.*P	Mean effect of cv.
		0	3	6			0	3	6		
Mammoth	0	6.43 h	7.17 f-h	7.67 e-h	7.09 d	8.31 b	8.07 jk	8.77 h-k	8.87 h-j	8.57 e	9.66 bc
	36	8.50 b-g	9.60 a-c	10.50 a	9.53 ab		9.47 g-i	10.40 d-g	12.37 a	10.74 b	
Mezza Rama	0	6.33 h	7.00 gh	7.33 f-h	6.89 d	7.56 c	7.71 k	9.50 g-i	9.72 f-i	8.98 de	9.55 c
	36	7.67 e-h	8.33 c-g	8.67 b-f	8.22 c		9.91 e-h	9.71 f-i	10.77 d-f	10.13 c	
Kaspa	0	6.67 h	8.67 b-f	9.33 a-d	8.22 c	8.72 b	8.74 i-k	9.71 f-i	10.04 d-g	9.50 d	10.01 b
	36	8.67 b-f	9.33 a-d	9.67 a-c	9.22 b		9.78 f-i	10.74 d-f	11.06 cd	10.53 bc	
Javor	0	7.83 d-h	9.00 a-e	10.00 a	8.94 bc	9.51 a	9.58 g-i	10.78 d-f	11.17 b-d	10.51 bc	11.12 a
	36	9.33 a-d	10.33 a	10.57 a	10.08 a		11.00 c-e	12.00 a-c	12.17 ab	11.72 a	
cv.*U.	Mam.	7.47 gh	8.38 d-g	9.08 b-d	Mean effect of Phosphorus		8.77 e	9.58 cd	10.62 b	Mean effect of Phosphorus	
	Me. Ra.	7.00 h	7.67 f-h	8.00 e-h			8.81 e	9.60 cd	10.25 bc		
	Ka.	7.67 f-h	9.00 b-e	9.50 a-c			9.26 de	10.23 bc	10.55 b		
	Ja.	8.58 c-f	9.67 ab	10.28 a			10.29 bc	11.39 a	11.67 a		
P*U.	0	6.82 c	7.96 b	8.58 b	7.79 b		8.53 d	9.69 c	9.95 c	9.39 b	
	36	8.54 b	9.40 a	9.85 a	9.26 a		10.04 c	10.71 b	11.59 a	10.78 a	
Mean effect of Urtica		7.68 c	8.68 b	9.22 a			9.28 c	10.20 b	10.77 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level The triple interaction among three factors caused significantly increased in this parameter and the maximum number of branches.plant^{-1} reached to (10.50 in the first season and 12.37 in the second season) for the treatment (Mammoth cv., 36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica). Compared with the minimum number of branches.plant^{-1} (6.33 in the first season and 7.71 in the second season) for the treatment (Mezza Rama cv. and 0 kg.ha^{-1} phosphorus). The result in table (3) display that Mezza Rama cv. significantly increased chlorophyll percentage, which gave (51.14% in the first season and 54.50% in the second season) compared with other cultivars. The highest chlorophyll% reached (48.56% in the first season and 51.44% in the second season) when application 36 kg.ha^{-1} of

phosphorus compared with control. Spraying Urtica significantly increased chlorophyll% during two growing seasons, the highest value (49.69% and 50.44%) respectively. The interaction between Mezza Rama cv. and 0 kg.ha^{-1} phosphorus gave the highest significant value (51.62%) in the first season, while the interaction between Mezza Rama cv. and 36 kg.ha^{-1} phosphorus gave the highest value (56.44%). The interaction between cultivars and urtica caused significant effect at both seasons, the interaction between Kaspa cv. and 6 g.l^{-1} Urtica in the first season gave the highest value (53.72%), while the interaction between Mezza Rama cv. and 6 g.l^{-1} Urtica in the second season gave the highest value (55.00%). The interaction between 36 kg.l^{-1} phosphorus and 6 g.l^{-1} urtica gave the highest significant value (50.82% in the first season and 52.21% in the second season). The triple interaction among three factors caused a significant effect, the highest value (54.67%) was obtained among (Kaspa cv., 36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica)in the first season, while in the second season the highest value (57.33%) was obtained among (Mezza Rama cv., 36 kg.ha^{-1} phosphorus and 3 g.l^{-1} urtica). Table (4) observed that the mammoth cv. significantly enhanced the numbers of pods.plant^{-1} during both study seasons which gave (93.39 in the first season and 108.11 in the second season) compared with other cultivars. Application phosphorus had a significant effect on number of pods.plant-1 (86.64 in the first season and 102.53 in the second season) compared with control (70.75 in the first season and 81.19 in the second season). Using 6 g.l^{-1} Urtica gave the maximum number of pods.plant^{-1} at both seasons (85.21 and 98.92) respectively. The interaction between cultivars and phosphorus had a significant effect, the highest value (104.56 in 2021-2022 and 122.67 in 2022-2023) was noticed between (Mammoth cv. and 36 kg.ha^{-1} of phosphorus). The maximum number of pods.plant-1 reached to (102.00 in the first season and 120.83 in the second season) was found between (Mammoth cv. and 6 g.l^{-1} of Urtica). The interaction between (36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica) during two seasons gave the largest number of pods.plant^{-1} reached to (9108 and 110.17) respectively. The triple interaction among (cultivars, phosphorus and Urtica) significantly increased number of pods.plant^{-1}, the maximum value (107.67 in the first season and 136.00 in the second season) was found among (Mammoth cv., 36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica). While the minimum value (39.00 in the first season and 38.33 in the second season) was found among (Mezza Rama cv., 0 kg.ha^{-1} phosphorus and 0 g.l^{-1} Urtica).

Table 3. Effect of phosphorus, urtica and their interaction on chlorophyll% of four cultivars pea plant

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022)					Second season (2022-2023)				
		Urtica (g.l^{-1})			cv.*P	Mean effect of cv.	Urtica (g.l^{-1})			cv.*P	Mean effect of cv.
		0	3	6			0	3	6		
Mammoth	0	43.80 g-i	45.60 f-h	45.47 f-h	44.96 bc	46.05 b	46.90 g-j	44.97 ij	46.63 g-j	46.17 c	47.20 c
	36	45.33 f-h	47.70 b-g	48.40 b-g	47.14 b		47.10 g-j	47.90 f-j	49.70 e-h	48.23 c	
Mezza rama	0	50.47 a-f	52.00 a-e	52.40 a-d	51.62 a	51.14 a	51.87 c-f	52.37 b-e	53.43 a-e	52.56 b	54.50 a
	36	48.47 b-g	50.47 a-f	53.07 ab	50.67 a		55.43 a-c	57.33 a	56.57 ab	56.44 a	
Kaspa	0	47.40 c-g	50.73 a-f	52.77 a-c	50.30 a	50.74 a	44.57 j	48.00 f-j	49.67 e-h	47.41	50.14 b
	36	48.40 b-g	50.47 a-f	54.67 a	51.18 a		50.93 d-g	54.27 a-d	53.40 a-e	52.87 b	
Javor	0	39.80 i	43.63 g-i	43.63 g-i	42.36 c	43.80 c	46.67 g-j	45.33 h-j	46.97 g-j	46.32 c	47.28 c
	36	41.80 hi	46.80 e-h	47.13 d-h	45.24 b		47.97 f-j	47.57 f-j	49.17 e-i	48.23 c	
cv.*U.	Mam.	44.57 e	46.65 de	46.93 de	Mean effect of Phosphorus		47.00 c	46.43 c	48.17 c	Mean effect of Phosphorus	
	Me. Ra.	49.47 b-d	51.23 a-c	52.73 ab			53.65 ab	54.85 a	55.00 a		
	Ka.	47.90 c-e	50.60 a-c	53.72 a			47.75 c	51.13 b	51.53 b		
	Ja.	40.80 f	45.22 e	45.38 e			47.32 c	46.45 c	48.07 c		
P*U.	0	45.37 d	47.99 bc	48.57 ab	47.31 a		47.50 c	47.67 c	49.18 bc	48.11 b	
	36	46.00 cd	48.86 ab	50.82 a	48.56 a		50.36 ab	51.77 a	52.21 a	51.44 a	
mean effect of Urtica		45.68 b	48.43 a	49.69 a			48.93 b	49.72 ab	50.69 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level

Table 4. Effect of phosphorus, urtica and their interaction on number of pods.plant-1 of four cultivars pea plant

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022)					Second season (2022-2023)				
		Urtica (g.l^{-1})			cv.*P	Mean effect of cv.	Urtica (g.l^{-1})			cv.*P	Mean effect of cv.
		0	3	6			0	3	6		
Mammoth	0	70.00 gh	80.33 d-f	96.33 bc	82.22 d	93.39 a	83.33 h	91.67 f-h	105.67 c-e	93.56 cd	108.11 a
	36	101.33 ab	104.67 ab	107.67 a	104.56 a		111.33 b-d	120.67 b	136.00 a	122.67 a	
Mezza rama	0	39.00 k	46.00 jk	47.00 jk	44.00 f	49.61 d	38.33 m	45.33 lm	47.67 lm	43.78 f	54.06 c
	36	49.33 j	55.33 ij	61.00 hi	55.22 e		55.33 kl	66.33 jk	71.33 ij	64.33 e	
Kaspa	0	70.67 f-h	83.00 de	85.00 de	79.56 d	83.94 c	82.00 hi	91.67 f-h	93.00 f-h	88.89 d	99.11 d
	36	86.00 c-e	88.67 c-e	90.33 cd	88.33 c		97.00 e-g	114.00 bc	117.00 bc	109.33 b	
Javor	0	64.33 hi	78.33 e-g	89.00 c-e	77.22 d	87.83 b	91.00 gh	100.33 d-g	104.33 c-f	98.56 c	106.17 a
	36	86.67 c-e	103.33 ab	105.33 ab	98.44 b		108.00 b-e	117.00 bc	116.33 bc	113.78 b	
cv.*U.	Mam.	85.67 c	92.50 bc	102.00 a	Mean effect of Phosphorus		97.33 cd	106.17 bc	120.83 a	Mean effect of Phosphorus	
	Me. Ra.	44.17 f	50.67 ef	54.00 e			46.83 f	55.83 e	59.50 e		
	Ka.	78.33 d	85.83 c	87.67 c			89.50 d	102.83 bc	105.00 bc		
	Ja.	75.50 d	90.83 bc	97.17 ab			99.50 c	108.67 b	110.33 b		
P*U.	0	61.00 d	71.92 c	79.33 b	70.75 b		73.67 e	82.25 d	87.67 cd	81.19 b	
	36	80.83 b	88.00 a	91.08 a	86.64 a		92.92 c	104.50 b	110.17 a	102.53 a	
mean effect of Urtica		70.92 c	79.96 b	85.21 a			83.29 c	93.38 b	98.92 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level

The result in table (5) displays that the planting of Mezza Rama cv. significantly increased weight of pod which gave (5.67 in the first season and 5.82 g in the second season) compared with other cultivars. The highest weight of pod (3.55 during 2021-2022 and 3.53 g during 2022-2023) when using 36 kg.ha^{-1} phosphorus compared with control. Spray 6 g.l^{-1} Urtica in the first season gave highest significant value (3.59 g), while spray 3 g.l^{-1} Urtica in the second season gave highest value (3.47 g). The highest weight of pods reached to (5.76 in the first season and 5.98 g in the second season) when interaction between (Mezza Rama cv. and 36 kg.ha^{-1} phosphorus). The interaction between (Mezza Rama cv. and 6 g.l^{-1} Urtica) in the first season gave the maximum significant value (5.76 g), whereas in the second season the interaction between (Mezza Rama cv. and 3 g.l^{-1} Urtica) gave the maximum value (5.93 g). the interaction between phosphorus and Urtica had a significant effect, the highest weight of pod reached to (3.73 in the first season and 3.59 g in the second season) from the interaction between (36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica). The triple interaction among three factors significantly enhanced weight of pod, the interaction among (Mezza Rama cv., 36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica) gave the highest value (5.90 in the first season, and 6.15 g in the second season).

Table 5. Effect of phosphorus, urtica and their interaction on weight of pod (g) of four cultivars pea plant.

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022)					Second season (2022-2023)				
		Urtica (g.l^{-1})			cv.*P	Mean effect of cv.	Urtica (g.l^{-1})			cv.*P	Mean effect of cv.
		0	3	6			0	3	6		
Mammoth	0	2.22 h	2.69 d-g	2.79 c-f	2.57 d	2.69 c	2.48 d	2.63 d	2.56 d	2.56 cd	2.69 b
	36	2.64 d-g	2.66 d-g	3.12 bc	2.81 c		2.78 d	2.83 d	2.84 d	2.81 c	
Mezza rama	0	5.55 a	5.58 a	5.62 a	5.58 a	5.67 a	5.51 c	5.84 a-c	5.62 bc	5.66 b	5.82 a
	36	5.64 a	5.73 a	5.90 a	5.76 a		5.77 a-c	6.02 ab	6.15 a	5.98 a	
Kaspa	0	2.68 d-g	2.75 c-f	2.93 b-e	2.79 c	2.92 b	2.75 d	2.72 d	2.68 d	2.72 cd	2.70 b
	36	3.03 b-d	2.89 b-e	3.25 b	3.06 b		2.67 d	2.63 d	2.73 d	2.68 cd	
Javor	0	2.32 gh	2.42 f-h	2.44 f-h	2.40 d	2.50 d	2.43 d	2.47 d	2.44 d	2.45 d	2.54 b
	36	2.62 d-g	2.55 e-h	2.63 d-g	2.60 cd		2.65 d	2.62 d	2.65 d	2.64 cd	
cv.*U.	Mam.	2.43 d	2.68 cd	2.96 b	Mean effect of Phosphorus		2.63 b	2.73 b	2.70 b	Mean effect of Phosphorus	
	Me. Ra.	5.59 a	5.66 a	5.76 a			5.64 a	5.93 a	5.89 a		
	Ka.	2.86 bc	2.82 bc	3.09 b			2.71 b	2.68 b	2.71 b		
	Ja.	2.47 d	2.48 d	2.54 d			2.54 b	2.54 b	2.55 b		
P*U.	0	3.19 c	3.36 bc	3.45 b	3.33 b		3.29 b	3.42 ab	3.33 b	3.35 b	
	36	3.48 b	3.46 b	3.73 a	3.55 a		3.47 ab	3.52 ab	3.59 a	3.53 a	
mean effect of Urtica		3.34 b	3.41 b	3.59 a			3.38 a	3.47 a	3.46 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level

Data in table (6) the largest length of pod (9.45 in the first season and 10.19 cm in the second season) was with Mezza Rama cv., while the lowest length of pod (6.43 in the first season and 6.41 cm in the second season) was with Javor cv. Application 36 kg.ha^{-1} phosphorus during two growing seasons significantly increased length of pod reached to (7.74 and 7.72 cm) respectively. Spray 6 g.l^{-1} Urtica during 2021-2022 season significantly increased length of pod (7.80 cm), while during 2022-2023 season had not significant

effect. The interaction between cultivars and phosphorus had a significant effect, the highest value (9.83 in the first season and 10.09 cm in the second season) was showed between (Mezza Rama cv. and 36 kg.ha^{-1} phosphorus).

Table 6. Effect of phosphorus, urtica and their interaction on length of pod (cm) of four cultivars pea plant

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022)					Second season (2022-2023)				
		Urtica (g.l^{-1})			cv.*P	Mean effect of cv.	Urtica (g.l^{-1})			cv.*P	Mean effect of cv.
		0	3	6			0	3	6		
Mammoth	0	6.41 h-j	7.39 c-e	7.11 d-g	6.97 d	7.09 c	6.30 e	6.74 c-e	6.57 c-e	6.54 c	6.92 b
	36	7.00 d-i	7.06 d-h	7.56 cd	7.20 cd		7.22 cd	7.33 c	7.38 c	7.31 b	
Mezza rama	0	9.09 b	9.00 b	9.12 b	9.07 b	9.45 a	9.44 b	10.44 a	10.39 a	10.09 a	10.19 a
	36	9.00 b	10.13 a	10.36 a	9.83 a		10.33 a	10.44 a	10.11 ab	10.30 a	
Kaspa	0	6.74 e-j	7.49 cd	7.38 c-e	7.20 cd	7.34 b	6.32 e	6.56 c-e	6.67 c-e	6.52 c	6.68 bc
	36	7.37 c-e	7.23 c-f	7.83 c	7.48 c		6.89 c-e	6.87 c-e	6.78 c-e	6.84 c	
Javor	0	6.09 j	6.54 g-j	6.56 f-j	6.39 e	6.43 d	6.23 e	6.35 de	6.56 c-e	6.38 c	6.41 c
	36	6.33 ij	6.57 f-j	6.50 g-j	6.47 e		6.30 e	6.33 e	6.66 c-e	6.43 c	
cv.*U.	Mam.	6.71 ef	7.22 cd	7.33 cd	Mean effect of Phosphorus		6.76 cd	7.04 c	6.97 c	Mean effect of Phosphorus	
	Me. Ra.	9.05 b	9.57 a	9.74 a			9.89 b	10.44 a	10.25 ab		
	Ka.	7.06 de	7.36 cd	7.61 c			6.61 cd	6.71 cd	6.72 cd		
	Ja.	6.21 g	6.55 fg	6.53 fg			6.27 d	6.34 d	6.61 cd		
P*U.	0	7.08 c	7.60 b	7.54 b	7.41 b		7.07 b	7.52 a	7.55 a	7.38 b	
	36	7.43 b	7.75 b	8.06 a	7.74 a		7.69 a	7.74 a	7.73 a	7.72 a	
mean effect of Urtica		7.25 b	7.68 a	7.80 a			7.38 a	7.63 a	7.64 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level

The highest length of pod in the first season reached to (9.74 cm) when interaction between (Mezza Rama cv. and 6 g.l^{-1} Urtica), whereas in the second season (10.44 cm) when interaction between (Mezza Rama cv. and 3 g.l^{-1} Urtica). The interaction between phosphorus and Urtica significantly increased length of pod, in the first season the highest value (8.06 cm) was found between (36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica), while in the second season the interaction between (36 kg.ha^{-1} phosphorus and 3 g.l^{-1} Urtica) gave the highest value (7.74 cm). The interaction among (cultivars, phosphorus and Urtica) significantly enhanced length of pod, the highest value in the first season (10.36 cm) was found among (Mezza Rama cv., 36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica). While in the second season the interaction among (Mezza Rama cv., 0 and 36 kg.ha^{-1} phosphorus and 3 g.l^{-1} Urtica) gave the highest value (10.44 cm). Table (7) found that the Mezza Rama cv. significantly increased width of pod at both seasons reached to (1.77 and 1.89 cm) respectively compared with other cultivars. The highest width of pod (1.73 in the first season and 1.83 cm in the second season) when application 36 kg.ha^{-1} phosphorus. Spray 6 g.l^{-1} Urtica in the first season gave the highest significant value (1.76 cm), while in the second season Urtica had not significant effect on width of pod. The interaction between (Mezza Rama cv. and 36 kg.ha^{-1} phosphorous) significantly increased width of pod which gave (1.86 in the first season and 1.94 cm in the second season. The interaction between cultivars and Urtica also had a significant effect, the maximum value in the

first season (1.86 cm) was obtained between (Mezza Rama cv. and 3 g.l^{-1} Urtica), while in the second season (1.92 cm) was between (Mezza Rama cv. and 6g.l^{-1} Urtica). The highest value in the first season (1.78 cm) was obtained between (36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica), whereas in the second season the highest value (1.84 cm) was between (36 kg.ha^{-1} phosphorus and 3 and 6 g.l^{-1} Urtica). The interaction among three factors was significant effect, in the first season the maximum width of pod (1.92 cm) was found among (Mezza Rama cv., 36 kg.ha^{-1} phosphorus and 3 g.l^{-1} Urtica), while in the second season (2.00 cm) was found among (Mezza Rama cv., 36 kg.ha^{-1} phosphorus and 0 g.l^{-1} Urtica).

Table 7. Effect of phosphorus, urtica and their interaction on width of pod (cm) of four cultivars pea plant

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022) Urtica (g.l^{-1}) 0	3	6	cv.*P	Mean effect of cv.	Second season (2022-2023) Urtica (g.l^{-1}) 0	3	6	cv.*P	Mean effect of cv.
Mammoth	0	1.59 g-i	1.65 e-h	1.70 c-g	1.64 c	1.67 b	1.85 a-e	1.86 a-d	1.87 a-c	1.86 bc	1.88 a
	36	1.66 d-g	1.69 c-g	1.74 c-e	1.70 bc		1.88 a-c	1.91 a-c	1.92 a-c	1.90 ab	
Mezza rama	0	1.51 i	1.79 b-d	1.77 b-e	1.69 bc	1.77 a	1.77 c-h	1.87 a-c	1.90 a-c	1.84 bc	1.89 a
	36	1.77 b-e	1.92 a	1.89 ab	1.86 a		2.00 a	1.89 a-c	1.94 a-b	1.94 a	
Kaspa	0	1.63 e-i	1.77 b-d	1.80 bc	1.73 b	1.69 b	1.71 d-i	1.80 b-h	1.69 f-i	1.73 de	1.76 b
	36	1.53 hi	1.70 c-g	1.73 c-f	1.66 c		1.70 e-i	1.84 a-f	1.83 b-g	1.79 cd	
Javor	0	1.60 f-i	1.70 c-g	1.70 c-g	1.67 bc	1.69 b	1.59 i	1.68 g-i	1.69 f-i	1.65 f	1.67 c
	36	1.70 c-g	1.68 c-g	1.73 c-f	1.70 bc		1.70 e-i	1.70 e-i	1.67 hi	1.69 ef	
cv.*U.	Mam.	1.63 fg	1.67 d-g	1.72 c-e	Mean effect of Phosphorus		1.87 a	1.89 a	1.89 a	Mean effect of Phosphorus	
	Me. Ra.	1.64 e-g	1.86 a	1.83 ab			1.88 a	1.88 a	1.92 a		
	Ka.	1.58 g	1.73 cd	1.77 bc			1.71 cd	1.82 ab	1.76 bc		
	Ja.	1.65 d-g	1.69 c-f	1.72 c-e			1.65 d	1.69 cd	1.68 cd		
P*U.	0	1.58 c	1.73 a	1.74 a	1.68 b		1.73 b	1.80 a	1.79 ab	1.77 b	
	36	1.67 b	1.75 a	1.78 a	1.73 a		1.82 a	1.84 a	1.84 a	1.83 a	
mean effect of Urtica		1.62 b	1.74 a	1.76 a			1.78 a	1.82 a	1.81 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level

The result in table (8) showed that the maximum number of seeds.pod^{-1} (9.13 in the first season and 9.78 in the second season) when planting Mezza Rama cv., while the minimum number of seeds.pod^{-1} (4.99 in the first season and 4.94 in the second season) when planting Javor cv. Application 36 kg.ha^{-1} phosphorus during both growing seasons significantly increased number of seeds.pod-1 which gave (6.99 and 6.55) respectively. The maximum value (7.06 in the first season and 6.57 in the second season) was noticed at 6 g.l^{-1} Urtica compared with control. The interaction between (Mezza Rama cv. and 36 kg.ha^{-1} phosphorus) gave the highest significant vale (9.46 in the first season and 9.89 in the second season). The interaction between (Mezza Rama cv. and 3 g.l^{-1} Urtica) in the first season gave the maximum number of seeds.pod-1 (9.58), whereas the interaction between (Mezza Rama cv. and 6 g.l^{-1} Urtica) in the second season gave the maximum value (10.17). The highest value (7.22 in the first season and 6.64 in the second season) was noticed between (36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica).The triple interaction among (Mezza Rama cv., 36 kg.ha-1 phosphorus and 3 g.l^{-1} Urtica) gave the highest number of seeds.pod^{-1} during both seasons (10.06 and 10.11) respectively.

Table 8. Effect of phosphorus, urtica and their interaction on number of seeds.pod^{-1} of four cultivars pea plant

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022)					Second season (2022-2023)				
		Urtica (g.l^{-1})			cv.*P	Mean effect of cv.	Urtica (g.l^{-1})			cv.*P	Mean effect of cv.
		0	3	6			0	3	6		
Mammoth	0	5.89 g-i	6.33 f-h	6.33 f-h	6.18 d	6.32 c	4.22 f	5.22 c-f	5.44 c-e	4.96 cd	5.48 b
	36	6.33 f-h	6.50 e-g	6.56 e-g	6.46 d		6.33 c	5.56 c-e	6.11 cd	6.00 b	
Mezza rama	0	8.22 d	9.11 bc	9.07 bc	8.80 b	9.13 a	8.67 b	10.00 a	10.34 a	9.67 a	9.78 a
	36	8.56 cd	10.06 a	9.78 ab	9.46 a		9.56 ab	10.11 a	10.00 a	9.89 a	
Kaspa	0	5.67 h-j	6.78 ef	7.11 ef	6.52 cd	6.71 b	4.39 ef	4.83 ef	5.00 d-f	4.74 d	5.07 bc
	36	6.67 e-g	6.89 ef	7.18 e	6.91 c		5.22 c-f	5.55 c-e	5.45 c-e	5.41 c	
Javor	0	4.67 k	4.78 k	5.11 jk	4.85 e	4.99 d	4.67 ef	5.00 d-f	5.22 c-f	4.96 cd	4.93 c
	36	4.89 k	5.11 jk	5.39 i-k	5.13 e		4.78 ef	4.89 ef	5.00 d-f	4.89 cd	
cv.*U.	Mam.	6.11 e	6.42 de	6.45 de	Mean effect of Phosphorus		5.28 cd	5.39 c	5.78 cd	Mean effect of Phosphorus	
	Me. Ra.	8.39 b	9.58 a	9.42 a			9.11 b	10.06 a	10.17 a		
	Ka.	6.17 e	6.83 cd	7.14 c			4.81 d	5.19 cd	5.22 cd		
	Ja.	4.78 f	4.95 f	5.25 f			4.72 d	4.95 d	5.11 cd		
P*U.	0	6.11 c	6.75 b	6.91 ab	6.59 b		5.49 b	6.26 a	6.50 a	6.08 b	
	36	6.61 b	7.14 a	7.22 a	6.99 a		6.47 a	6.53 a	6.64 a	6.55 a	
mean effect of Urtica		6.36 b	6.94 a	7.06 a			5.98 b	6.40 a	6.57 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level

Data in tables (9 and 10) demonstrated that the Mezza Rama cv. significantly enhanced the total yield during both study seasons which gave (281.91 g.plant-1 and t.ha-1 in the first season and 346.85 g.plant^{-1} and t.ha-1 in the second season) compared with other cultivars. Application 36 kg.ha^{-1} phosphorus gave the maximum total yield reached to (284.67 g.plant-1 and t.ha-1 in the first season and 338.41 g.plant-1 and t.ha^{-1} in the second season) compared with control. Spray 6 g.l^{-1} Urtica significantly increased total yield (283.30 g.plant^{-1} and t.ha-1 in the first season and 319.73 g.plant-1 and t.ha-1 in the second season).

Table 9. Effect of phosphorus, urtica and their interaction on total yield (g.plant^{-1}) of four cultivars pea plant.

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022)					Second season (2022-2023)				
		Urtica (g.l^{-1})			cv.*P	Mean effect of cv.	Urtica (g.l^{-1})			cv.*P	Mean effect of cv.
		0	3	6			0	3	6		
Mammoth	0	155.71 j	216.66 hi	268.05 d-f	213.47 e	254.05 b	206.23 l	241.99 i-l	271.32 f-k	239.85 d	292.74 b
	36	266.98 d-g	279.24 cd	337.64 ab	294.62 ab		309.51 d-g	341.27 c-e	386.13 bc	345.64 b	
Mezzarama	0	216.33 hi	257.00 d-h	264.34 d-h	245.89 cd	281.91 a	240.40 j-l	295.37 d-i	299.25 d-i	278.34 c	346.85 a
	36	278.03 cd	316.40 a-c	359.37 a	317.93 a		346.30 cd	429.61 ab	470.15 a	415.35 a	
Kaspa	0	190.39 ij	228.00 e-i	248.33 d-h	222.24 de	246.32 b	225.64 kl	249.24 h-l	249.14 h-l	241.34 d	266.96 c
	36	260.51 d-h	256.61 d-h	294.04 b-d	270.39 bc		259.46 g-l	299.45 d-i	318.82 d-f	292.57 c	
Javor	0	149.68 j	189.59 ij	217.52 g-i	185.60 f	220.67 c	221.03 kl	247.81 i-l	255.16 g-l	241.34 d	270.71 c
	36	226.98 f-i	263.18 d-h	277.09 c-e	255.75 c		286.05 e-i	306.33 d-h	307.89 d-g	300.09 c	
cv.*U.	Mam.	211.35 ef	247.95 cd	302.85 a	Mean effect of Phosphorus		257.87 cd	291.63 c	328.73 b	Mean effect of Phosphorus	
	Me. Ra.	247.18 cd	286.70 ab	311.86 a			293.35 c	362.49 ab	384.70 a		
	Ka.	225.45 de	242.31 c-e	271.19 bc			242.55 d	274.34 cd	283.98 c		
	Ja.	188.33 f	226.39 de	247.31 cd			253.54 cd	277.07 cd	281.53 cd		
P*U.	0	178.03 e	222.81 d	249.56 c	216.80 b		223.32 e	258.60 d	268.72 d	250.21 b	
	36	258.12 bc	278.86 b	317.04 a	284.67 a		300.33 c	344.17 b	370.75 a	338.41 a	
mean effect of Urtica		218.08 c	250.84 b	283.30 a			261.83 c	301.38 b	319.73 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level

Highest total yield (317.93 g.plant^{-1} and t.ha^{-1} during first season and 4.15.15 g.plant^{-1} and t.ha^{-1} during second season) when interaction between (Mezza Rama cv. and 36 kg.ha^{-1} phosphorus). The interaction between cultivars and Urtica significantly increased total yield during two growing seasons, the maximum value (311.86 g.plant^{-1} and t.ha^{-1} and 384 g.plant^{-1} and t.ha^{-1}) respectively was observed between (Mezza Rama cv. and 6 g.l-1 Urtica). The interaction between (36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica) gave the highest significant value (317.04 g.plant^{-1} and t.ha^{-1} in the first season and 370.75 g.plant^{-1} and t.ha^{-1} in the second season). The interaction among (Mezza Rama cv., 36 kg.ha^{-1} phosphorus and 6 g.l^{-1} Urtica) gave the maximum total yield (359.37 g.plant^{-1} and t.ha^{-1} in the first season and 470.15 g.plant^{-1} and t.ha^{-1} in the second season). The minimum value in the first season (149.68 g.plant^{-1} and t.ha^{-1}) was noticed among (Javor cv., 0 kg.ha-1 phosphorus and 0 g.l^{-1} Urtica), while in the second season the minimum value (2.06.23 g.plant-1 and t.ha^{-1}) was noticed among (Mammoth cv., 0 kg.ha^{-1} phosphorus and 0 g.l^{-1} Urtica).

Table 10. Effect of phosphorus, urtica and their interaction on total yield (t.ha^{-1}) of four cultivars pea plant

Cultivars	Phosphorus (kg.ha^{-1})	First season (2021-2022)					Second season (2022-2023)				
		Urtica (g.l^{-1})			cv.*P	Mean effect of cv.	Urtica (g.l^{-1})			cv.*P	Mean effect of cv.
		0	3	6			0	3	6		
Mammoth	0	7.61 j	10.59 hi	13.10 d-f	10.44 e	12.42 b	10.08 l	11.83 i-l	13.26 f-k	11.73 d	14.31 b
	36	13.05 d-g	13.65 cd	16.51 ab	14.40 ab		15.13 d-g	16.68 c-e	18.88 bc	16.90 b	
Mezzarama	0	10.58 hi	12.56 d-h	12.92 d-h	12.02 cd	13.78 a	11.75 j-l	14.44 d-j	14.63 d-i	13.61 c	16.96 a
	36	13.59 cd	15.47 a-c	17.57 a	15.54 a		16.93 cd	21.00 ab	22.98 a	20.31 a	
Kaspa	0	9.31 ij	11.15 e-i	12.14 d-h	10.86 de	12.04 b	11.03 kl	12.18 h-l	12.18 h-l	11.80 d	13.05 c
	36	12.74 d-h	12.55 d-h	14.38 b-d	13.22 bc		12.68 g-l	14.64 d-i	15.59 d-f	14.30 c	
Javor	0	7.32 j	9.27 ij	10.63 g-i	9.07 f	10.79 c	10.81 kl	12.12 i-l	12.47 g-l	11.80 d	13.23 c
	36	11.10 f-i	12.87 d-h	13.55 c-e	12.50 c		13.98 e-j	14.98 d-h	15.05 d-g	14.67 c	
cv.*U.	Mam.	10.33 ef	12.12 cd	14.81 a	Mean effect of Phosphorus		12.61 cd	14.26 c	16.07 b	Mean effect of Phosphorus	
	Me. Ra.	12.08 cd	14.02 ab	15.25 a			14.34 c	17.72 ab	18.81 a		
	Ka.	11.02 de	11.85 c-e	13.26 bc			11.86 d	13.41 cd	13.88 c		
	Ja.	9.21 f	11.07 de	12.09 cd			12.40 cd	13.55 cd	13.76 cd		
P*U.	0	8.70 e	10.89 d	12.20 c	10.60 b		10.92 e	12.64 d	13.14 d	12.23 b	
	36	12.62 bc	13.63 b	15.50 a	13.92 a		14.68 c	16.83 b	18.13 a	16.54 a	
mean effect of Urtica		10.66 c	12.26 b	13.85 a			12.80 c	14.73 b	15.63 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level

DISCUSSIONS

As shown in tables 1 through 10, cultivars, phosphorus, Urtica, and their interactions all significantly influenced vegetative and yield characteristics over both seasons. Four cultivars were discovered to have significant differences in terms of vegetative and yield characteristics; Mammoth and Mezza Rama cv. performed the best in comparison to the others and may be better suited to the research area's environmental conditions. Alternately, in addition to changes in cultivars genotype and phenotype, it may be the result of environmental influences. This is consistent with the conclusions of Alam and Hossain (1), who discovered that the environment had a significant influence on vegetative and yield characteristics. This was evident from variations in genotypic variance and phenotypic variance. For the effect of phosphorus, the application of 36 kg.ha^{-1} of phosphorus significantly enhanced all parameters, phosphorus application may improve the absorption of phosphorus, potassium, and other elements in the root, delaying leaf senescence and enhancing nutrient intake to produce rapid growth and biomass (23). These results are consistent with those of (14), who found that the administration of phosphorus resulted in the largest number of pods per plant as well as the maximum length of pod. Gupta *et al.* (5) also noted that the use of phosphorus boosted the yield characters; these were pod weight, pod length, and number of grains per pod. Getachew Agegnehu (3) discovered similar results, finding that applying phosphate fertilizer at rates of 10, 20, and 30 kg P ha^{-1} enhanced field pea mean grain yields by 36, 67, and 57%, respectively, in comparison to the control. The using of Urtica extract improved the vegetative and yield parameters of pea in our experiment. The plant's weight may have risen with the addition of Urtica due

to its stimulating properties and ability to improve the plant's absorption of other nutrients, including the macronutrients N, P, and K. These elements also boost the nutrient's concentration in the leaves and its absorption into the plant's metabolic processes. The chemical composition of several green solid manures, including nettle, was examined by (20). They discovered that nettle manure included significant levels of boron (B) and that the low C:N ratios of green manures had a greater impact on plant productivity than the total amount of N provided through solid soil treatments. As a result, we will see in the outcome that Urtica increased the majority of research parameters. Minerals and other nutrients may increase nutrient availability and absorption in Urtica L. extract, leading to enhanced growth and development (13). According to Dozet *et al.* (2), foliar application of aqueous plant extracts of Urtica dioica and Pulmonaria officinalis enhanced soybean yield only 9% when compared to the control treatment, while extract prepared purely of nettle boosted yield even less, by 7%.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF FUND

The authors declare that they have not received a fund.

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