

The Effect Of Organic Fertilizer And Urea On The Growth And Yield Of The Pea Plant *Pisium Sativum* L

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Abstract

The study was conducted at the Agricultural Research Station of the College of Agriculture / Basra University in the 2018-2019 agricultural season with the aim of studying the effect of two levels of nitrogen fertilizer on the urea body at two levels (100, 50) kg/ d and three different types of organic fertilizers (sheep manure, cow manure and potassium humate fertilizer) at a level of 20 tons / ha in addition to the comparison treatment (without fertilization) in the growth and production of the local variety pea plant. The Plot- Split Design was carried out as a one-time split-factor experiment according to the RCBD with three replications for each treatment, so the number of experimental units was (2 × 4 × 3), so the number of experimental units would be 24 experimental units, and at each of the two adjacent lines, one sector. Urea fertilizer in the main plots to be the plot main factor, and organic fertilizer in the secondary plot as the plot sub. The study showed that the level of 100 kg / d of urea fertilizer caused a significant increase in plant height, leaf content of total chlorophyll and the percentage of nitrogen. The study also showed that the different types of organic fertilizers, at the level of 20 tons / ha led to a significant increase in plant height, total chlorophyll content, and the percentage of nitrogen, phosphorus and potassium in the leaves. As for the bilateral overlaps between the studied factors, they were significant for all traits.

Keywords: organic fertilizer, urea, pea plant, *Pisium sativum* L.

Introduction

The peas *Pisium sativum* L. belongs to the Leguminosae family, and the leguminous family is one of the economically important plant families, as it occupies the second place after the grass family in terms of importance, and the area cultivated with crops of the legume family amounts to 12-15% of the area of agricultural land and global production reaches About 27% of the world's cereal production (Karpnstein and steulpuage 2000). The region of Southwest Asia, Afghanistan and India is the original home of it (Hemphil 2001).

It is noted that there is an increase in its annual consumption due to its inclusion in the main meals for the Iraqi consumer, whether fresh or after freezing because of its high nutritional value and that because it contains a high percentage of protein as it is rich in ascorbic acid, in addition to this, we find that there are quantities There is nothing wrong with carbohydrates as well from the outside (Matlab and Adai, 2002) Fertilization is one of the most important crop service processes and one of the important production methods because of its great influence in organizing and providing what

the physiological processes of plants need, especially nutrients (Abu Dahi and Younes, 1988) Many researchers have been interested in studying the effects of organic fertilizers on plant growth and yield, as organic matter is one of the important and effective factors in influencing the readiness of plant nutrients due to its properties that affect the soil's nutrient content and make it ready for absorption by the plant and then positively affect growth and development. The plant (Tisdale et al., 1997) The organic matter also affects the properties of the soil in general by improving the relationship of soil, water and plants, the phenotypic density and the overall porosity of the soil, and the efficiency of water use (Shaaban and Okasha), 2007 (on the other hand, the organic fertilizers added to the soil are less hazardous to the environment and also provide a slow release of nutrients from The path of micro-organisms activity that works to release elements from organic materials, transforming them into mineral elements ready for plants, in a way that promotes better plant growth (Haghighi et al. 2016) Nitrogen is the most important element in plant nutrition, as it enters in the processes of plant cell growth, development and division, and enters into the formation of protein and amino acids, and nitrogen comes first in terms of the amount needed by the plant, so its readiness in the soil during the stages of plant growth, especially at the stage Branching and elongation of plant growth is necessary to obtain good crop yields (Jan et al., 2010) Where the nitrogen in the soil is exposed to a continuous loss by absorbing it, or by washing by irrigation, rainwater, or denitrification, and this deficiency is compensated for by adding organic and mineral fertilizers, and a major part of it is compensated by bio-fixing atmospheric nitrogen. The great importance of leguminous plants in increasing the fertility of the soil by fixing atmospheric nitrogen by the bacteria of the genus Rhizobia during their cooperative life with the leguminous plant (Rashidi and Taj Al-Din, 1988 In view of the importance of adding organic fertilizers and urea together in the growth and yield of the pea plant, this study was conducted

Materials and methods

A field experiment was conducted during the winter agricultural season 2018-2019 in one of the fields of the Agricultural Research Station affiliated to the College of Agriculture / University of Basra, with the aim of studying the effect of adding different types of organic fertilizers and adding nitrogen fertilizers to the local variety peas. Table (1) shows some chemical and physical characteristics of the field soil. The animal manure, sheep and cow manure, was collected and prepared from the fields of the College of Agriculture / Basra University in the Agricultural Research Station. Then each of these wastes was placed separately in concrete ponds 3 x 6 m away, then wetted until saturation and then covered with plastic for the purpose of encouraging reactions to accelerate the process of decomposition The waste was fermented for three months (Hassan et al., 1990) At the end of the decomposition period, a sample was taken from each type of organic fertilizer for the purpose of analysis (Table 2).

The organic material potassium humate used in the study is of the high-potassium Powhumus type produced by the German company Gmbh Humintech of the solid (granular) type and is used by adding it to the soil before planting. Table (3) shows the specifications of the humic acid used in the experiment. The soil was plowed, smoothed and leveled, then it was divided into six lines, each line length of 20 m. Each line was divided into four experimental units, the length of each experimental unit was 5 m, the distance between the lines was 1.50 m the lines were opened to a depth of 30 cm Organic fertilizers (cows, sheep and potassium humate) were added according to random

distribution of transactions within the sector during soil preparation and before the planting date. Urea fertilizer was added before planting to the lines, both according to design and according to the concentration used in the experiment. Then drip irrigation systems were installed in the middle of the center, and the distance between one point and another was 25 cm. The seeds of peas of the local variety taken from the local market were planted on October 15, 2018 on either side of the drip, opposite the drip hole at a depth of (3 cm) and at a distance of 25 cm between one and another. Each jura has 3 seeds. After the completion of the germination, the plants were reduced to one plant in each hollow, so that the plant density was (6.66) plants / d The service operations of irrigation, weeding, disease and insect control were conducted identically for all treatments. The experiment included two factors:

The first factor: addition of urea, with two levels

1-First level 50 kg / d

2-The second level 100 kg / d

The second factor: Adding three types of organic fertilizers

1-Comparison transaction without any addition

2-Sheep manure at the level of 20 tons / ha

3- Cow manure at the level of 20 tons / ha

4- Potassium humate fertilizer at the level of 20 tons / ha

was carried out as a split-plot design, according to the Randomized Complete Block Design (R.C.B.D), with three iterations for each treatment, so that the number of experimental units was 24 experimental units and every two lines adjacent to one sector were counted. As urea fertilizer was placed in the main plots to be the plot main factor and the organic fertilizer in the secondary plots to be the plot sub factor. The results were statistically analyzed using the Gen stat statistical analysis program. God, 2000

At the end of the experiment, the following measurements were taken:

1- Plant height(cm):The plant height was measured for five plants taken from the center of each experimental unit, and the height was taken from the soil surface level to the highest growing peak by means of a tape measure.

2-Leaf content of total chlorophyll (ml. 100 gm fresh weight)

The total chlorophyll stain was estimated in the leaves according to the method (Zeahringer et al, 1974.)

3-Nitrogen concentration in leaves(%)

0.2 gm of dry leaves were taken and digested according to the method (Cresser and Parsons, 1979). The amount of nitrogen in the digested samples using a microkjeldhal device as described in (Page et al, 1982)

4-Potassium concentration in leaves(%)

5-Potassium was measured in the digested paper samples, using a flame photometer, according to the method (Page at Al, 1982).

6-Phosphorus concentration in leaves(%)

7-Phosphorous was estimated by the method of ammonium molybdates and ammonium vanadate. The color intensity of the solution was measured by a spectrometer at a wavelength of 470 nm, according to the method of(Murphy and Riley, 1962)

9-Total yield of fresh seeds (t/d)

Table (1) Some physical and chemical properties of the experiment soil

Type of analysis	measruing unit	the value
EC	ds.m ⁻¹	4.23
pH	-	.754
Total nitrogen	g.kg ⁻¹	21.2
Ready phosphorous	g.kg ⁻¹	0.011
Ready Potassium	g.kg ⁻¹	1.15
Organic matter	%	1.02
clay	%	44.53
Silt	%	40.22
Sand	%	13.22
Soil tissue	-	Silty clay
Humidity at field capacity	%	27.32

Table (2) some components of the potassium humate fertilizer used in the experiment

Component	the value
Potassium humate	%85
Potassium	12.0
Nitrogen	0.8

other ingredients		15				
Compost type	pH	E.C	Organic carbon	N total	P total	K total
Sheep manure	7.3	9.6	268	15.31	11.01	18.45
Cow manure	6.5	8.1	292	17.34	13.34	20.11
Minor items		0.1				

Table (3) some chemical properties of the organic fertilizers used in the experiment after fermentation

Results and discussion

1- The effect of levels of urea and organic fertilizers, and the interplay between them, on the vegetative growth characteristics of peas

1-Plant height (cm)

It is evident from Table (4) that the addition of urea fertilizer had a significant effect on the characteristic of plant height, as the highest rate of plant height reached (76.89) cm at the level of 100 kg / d

It is also evident from the tables that the addition of organic fertilizer had a significant effect on the characteristics of plant height, as it gave potassium humate fertilizer at a level of 20 tons / hectare as it gave (74.82) cm compared to the comparison treatment. Where it is clear from the table that the .interaction between the two workers was not significant

Table (4) The effect of urea and compost levels and their overlap on plant height (cm) for peas

The effect of Organic fertilizer levels	The effect of urea fertilizer levels		Average effect of fertilizer treatments
	50 kg/d	100kg/d	
control	59.82	72.29	65.82
Sheep manure at level 20	65.48	76.46	70.97

T/h			
Cow manure at level 20 T/h	67.55	78.44	72.99
Potassium humate fertilizer at level 20 T/h	69.29	80.35	74.82
Average effect of of urea fertilizer treatments	65.82	76.89	
L.S.D(0.05)	Urea fertilizer	Organic fertilizer	interaction
	2.00	1.72	n.s

It is evident from the results of Table (4) that the addition of urea at the level of 100 kg / d led to an increase in the height of the pea plant, which is due to the positive role of nitrogen in increasing the activity of meristematic tissues and cell division and the importance of the nitrogen component in. Building amino acids such as tryptophan, which forms the basis for building auxins, which have an important role in increasing cell division and expansion (Sabh and Shallan ,2008)

Also, increasing plant height when fertilizing with organic fertilizer potassium humate is due to the important role of organic matter in reducing the degree of soil interaction and its apparent effect in increasing the readiness of nutrients in the soil and thus increasing its absorption

The above results are consistent with what was found by Kamal et al. (2016) on pea plants

2 - the effect of levels of urea and organic fertilizers, and the interplay between them, on the chemical properties of peas

1-Leaf content of total chlorophyll (ml/ 100g soft weight)

It is evident from Table (5) that the level of 100 kg / d of urea fertilizer gave the highest significant effect to the leaf content of the total chlorophyll.

The same table also shows that organic fertilizer has a significant effect on the total chlorophyll content of leaves, as it exceeds the potassium humate fertilizer at the level of 5 kg / d compared to the comparison treatment.

It is also clear from the table that the interaction between the two workers was significant, as the treatment gave 20 kg / dunum of urea fertilizer + potassium humate fertilizer at a level of 5 kg / d with the highest content of chlorophyll in the leaves, where it reached (44.28) ml/ 100 gm fresh weight

Table (5) The effect of urea and organic fertilizer levels and the interaction between them on the leaf content of total chlorophyll (mg / 100 gm fresh weight) for peas

The effect of Organic fertilizer levels	The effect of urea fertilizer levels		Average effect of fertilizer treatments
	50 kg/d	100kg/d	
control	18.51	30.92	24.71
Sheep manure at level 20 T/h	23.09	32.87	27.98
Cow manure at level 20 T/h	26.88	36.17	31.52
Potassium humate fertilizer at level 20 T/h	28.63	44.28	36.45
Average effect of of urea fertilizer treatments	24.28	36.06	
L.S.D(0.05)	Urea fertilizer	Organic fertilizer	interaction
	1.84	1.40	1.93

2- Leaf total nitrogen content(%)

It is evident from Table (6) that urea fertilizer had a significant effect on the total nitrogen content of leaves, as the level exceeded 100 kg / d in giving the highest total nitrogen content, which reached (4.45%).(

It is also evident from the table that organic fertilizer had a significant effect on leaf content of total nitrogen, as it exceeded cow manure Cow manure at a rate (%) of soil weight as it gave the highest content, reaching (3.90%) compared to the comparison treatment.

It is also clear from the table that the interaction between the two workers was significant, as the treatment of urea fertilizer at a level of 100 kg / d + treatment of Cow manure at a rate (%) of soil weight gave the highest content of total nitrogen, reaching (4.45%)

Table (6) The effect of urea and compost levels and the interaction between them on the total nitrogen content of peas in leaves(%)

The effect of Organic fertilizer levels	The effect of urea fertilizer levels		Average effect of fertilizer treatments
	50 kg/d	100kg/d	
control	2.43	3.92	3.18
Sheep manure at level 20 T/h	2.70	4.33	3.51
Cow manure at level 20 T/h	2.99	4.81	3.90
Potassium humate fertilizer at level 20 T/h	2.88	4.73	3.81
Average effect of of urea fertilizer treatments	2.75	4.45	
L.S.D(0.05)	Urea fertilizer	Organic fertilizer	interaction
	0.06	0.11	0.13

3 -Leaf content of total phosphorous(%)

It is evident from Table (7) that a level of 100 kg / d of urea fertilizer had a significant effect on the leaves content of total phosphorus, which gave (0.38%)

The same table also shows that organic fertilizer has a significant effect on the total phosphorous content of leaves, as it exceeded Cow manure at a rate (%) of soil weight as it gave (0.37%) compared to the comparison treatment.

It is also evident from the same table that the interaction between the two workers was significant, as the treatment of urea fertilizer at a level of 100 kg / d + treatment of Cow manure at a rate (%) of soil weight gave the highest content of total phosphorus, which reached (0.52%)

Table (7) The effect of urea and compost levels and the interaction between them on leaf content of total phosphorous (%) of peas

The effect of Organic	The effect of urea fertilizer levels		Average effect ض of fertilizer treatments

fertilizer levels	50 kg/d	100kg/d	
control	0.13	0.29	0.21
Sheep manure at level 20 T/h	0.15	0.33	0.24
Cow manure at level 20 T/h	0.23	0.52	0.37
Potassium humate fertilizer at level 20 T/h	0.18	0.38	0.28
Average effect of of urea fertilizer treatments	0.17	0.52	
L.S.D(0.05)	Urea fertilizer	Organic fertilizer	interaction
	0.02	0.03	0.04

4- Leaf content of total potassium (%)

Table (8) shows that the level of 100 kg / d of urea fertilizer gave a significant effect to the total potassium content of leaves, reaching (1.82%.)

The same table also shows that organic fertilizer has a significant effect on the total potassium content of leaves, as the potassium humate fertilizer exceeds the level of 5 kg / h in the highest content of total potassium in the leaves, reaching (1.78%) compared to the comparison treatment, as the table shows that the interaction between the two workers was Not moral

Table (8) The effect of urea and compost levels and the interaction between them on the total potassium content of leaves (%) of peas

The effect of Organic fertilizer levels	The effect of urea fertilizer levels		Average effect ^ض of fertilizer treatments
	50 kg/d	100kg/d	
control	1.21	1.57	1.39
Sheep manure at level 20 T/h	1.50	1.87	1.68
Cow manure at level 20	1.43	1.92	1.68

T/h			
Potassium humate fertilizer at level 20 T/h	1.61	1.95	1.78
Average effect of of urea fertilizer treatments	1.44	1.83	
L.S.D(0.05)	Urea fertilizer	Organic fertilizer	interaction
	0.16	0.08	0.13

The increase in leaf content of total chlorophyll as a result of adding urea fertilizer is due to the role of nitrogen, which leads to the creation of a good nutritional state for a plant, which caused a state of nutritional balance and thus increased biological processes that encouraged the formation of proteins, nucleic acids and chlorophyll and thus increased its content in the leaves (Al-Fodder, 2012)

The increase in the levels of nitrogen, phosphorous and potassium in the leaves as a result of the addition of urea fertilizer is due to the direct absorption of this element from the soil, as well as that it helps to form a good vegetative and root system as a result of the increase in the total chlorophyll content and thus increase the absorption and accumulation of nitrogen, phosphorous and potassium in the leaves(Salaa and Moncholi, 1992.)

These results are consistent with what al-Shammari on the cowpea plant (2011)

Also, the various fertilizer additions of organic fertilizer have caused a significant increase in the content of peas leaves from total chlorophyll and the percentage of nitrogen, phosphorous and potassium due to the content of potassium humate fertilizer from nitrogen, which is one of the important compounds in building the chlorophyll molecule (Muhammad and Yunus, 1991)

The addition of cow manure led to an increase in the phosphorus component due to the increase in phosphorous absorbed by the plant, and thus the increase in the content of the leaves and the increase in the potassium and nitrogen component, because organic waste is a source of nutrients ready for the plant through its high content, as well as reducing the loss of elements through washing By adsorption on colloidal surfaces (Allen and Zink, 1998)

These results are consistent with Samra and Hiyam (2011)

The effect of urea and organic fertilizer levels and their overlap on the total productivity of green seeds (ton / d)

It is evident from Table (10) that the level of 100 kg / d of urea fertilizer had a significant effect on the total productivity of fragrant seeds, as it gave the highest yield of (2.18) tons / d.

The same table also shows that organic fertilizer has a significant effect in increasing the total productivity of fresh seeds, as potassium humate fertilizer exceeded the level of 5 kg / d as it gave

the highest total productivity of fresh seeds which amounted to (2.17) tons / d compared to the comparison treatment.

It is also evident from the table that the overlap between the two factors was not significant

Table (10) the effect of levels of urea and organic fertilizers and the interaction between them on (the total productivity of fresh seeds (ton / d)

The effect of Organic fertilizer levels	The effect of urea fertilizer levels		Average effect of fertilizer treatments
	50 kg/d	100kg/d	
control	1.19	1.87	1.53
Sheep manure at level 20 T/h	1.47	1.96	1.71
Cow manure at level 20 T/h	1.68	2.36	2.02
Potassium humate fertilizer at level 20 T/h	1.81	2.52	2.17
Average effect of of urea fertilizer treatments	1.54	2.18	
L.S.D(0.05)	Urea fertilizer	Organic fertilizer	interaction
	0.42	0.13	n.s

It is evident from the results of Table (10) that the addition of urea fertilizer led to an increase in the overall productivity, due to the role of urea in increasing the growth and spread of the shoots and thus increasing the possibility of absorption of nutrients, as well as the role of nitrogen in increasing the rate of photosynthesis in the leaves and thus increasing the accumulation of materials manufactured in Pods and increase their number in the plant and thus increase the total yield) (Hamid and Hossuin, 2007

The increase in total productivity as a result of adding organic fertilizer is also attributed to the role of organic matter in releasing nutrients and improving the physical and biological properties of the soil and to the role of humus acid present in potassium humate fertilizer in improving vegetative growth and reducing food competition between pods, thus increasing the number of pods in the plant (ELDesuki et al. 2010)

This is consistent with what Shafeek et al. (2013).

Conclusions and recommendations

Conclusions1 -

We conclude from this experiment that adding urea and organic fertilizer has an important and vital role in the growth and development of the pea plant, which is positively reflected in the increase of the plant's yield of soft seeds.

Recommendations

1-It is recommended to add urea fertilizer at a level of 100 kg / d to increase the vegetative growth and chemical properties of the plant and increase the overall productivity of the pea plant

2-It is recommended to add the organic fertilizer potassium humate to increase the vegetative growth and yield of the plant, as well as add animal wastes such as cow manure to increase the leaf content of the elements

3-It is recommended to add urea fertilizer with other types of organic fertilizers to other plants of the legume family

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