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Effect of Soil Surface Coverage and Irrigation Level on Behavior of Nitrogen, Phosphorus and Growth of Corn Plant (*Zea mays L.*)

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Abstract

The present study was conducted at Agricultural Research Station, Grmat Ali, College of Agriculture, University of Basra, Iraq, during the agricultural season of 2013-2014. The aim was to study the effect of covering soil surface by black plastic and two levels of irrigation either adding water at 60% or 100% of field capacity. As well as the effect of three levels of nitrogen (0, 30, and 60 mg N kg^{-1}) and three levels of phosphorus (0, 40 , and 80 mg p kg^{-1}). Pots divided into two groups, with and without soil coverage. Pots were planted with ten corn grains with maintain soil moisture at field capacity till germination and seedling coloring, number of seedling thinned to five. Plants harvested after 60 days from planting, and were dried and weighted. Plant samples were analyzed for nitrogen and phosphorus.

Results showed that coverage treatments had increased dry matter of corn shoots and the uptake of nitrogen and phosphorus. The results also showed the superiority of irrigation at 100% field capacity in comparison with 60% of field capacity. Increasing levels of nitrogen and phosphorus caused significant increase in dry weight, nitrogen and phosphorus concentrations and their uptake.

Keywords: *soil coverage, irrigation level, nitrogen, phosphorus.*

Introduction

Deficient irrigation concept and its uses has developed in arid, and semi-arid regions around the world as a result of high demand on irrigation water and a limit of its resources (Miller and Aarstad,1976). Deficient irrigation is defined as the adding of water carefully and thoughtful to irrigate crops when there is a balance between evaporation-transpiration and leaching requirements during different stages of plant growth or during the whole season. The aim of this method is to increase the efficiency of water use.

Salinity is an effective factor on crop yield through its osmotic impact which decreases water availabilities' to plants. Decreasing evaporation (by covering soil surface) can help soil moisture conservation, increase water availability to the plants and reducing salts accumulation at soil surface (Hanson *et al*1999; Mao,1998) reported that covering soil can enhance plant growth in comparison with uncovered soil under salinity circumstances. Soil coverage is the most important agricultural activities in reducing soil moisture, cooling soil surface, compromising soil physical ecology, reducing and controlling soil erosion, reducing evaporation from soil surface, tool of anti-bush, soil temperature balance, early crop production, reducing ability of root growth outside the soil in small plants as a result of soil freezing and warming rotation during fall, winter and spring, adding organic matter to the soil if the coverage materials are organic and rises the availability of nutrients(Chalker-Scott,2007). Since the direct evaporation of water from the soil often comprises main losses of available water, as a result of not contributing of this water to organic mass. Reducing evaporation can help conservation of soil moisture and irrigation water and reducing accumulation of salt on soil surface (Roberts,1994).

Average corn yield per area unit in Iraq still low in comparison with world-wide yield of Egypt, USA and Canada,(Al-Mamouri,1997) due to many reasons such as low yield of local cultivators, low management, high soil salinity and misuse of chemical fertilizer NPK as well as adding them at wrong time or at critical growth period, (Ashley *et al.*, 2006; Abdulwakeel *et al.*, 2005) .

Phosphorus play many important rules in plants. It is essential for germination through its importance in energy production. It is stored in seeds as phyttine which is calcium and magnesium salts of phatic acid. Phosphorus is also one of main nutrients that plants need in high quantity (Mengle and Kirkby, 1987). Retention of phosphorus by participation processes or adsorption or covering it by carbonate reducing phosphorus availability when used as fertilizer because the fast forming of compounds that has very low solubility to the plants. (Havlin *et al*., 2005). Feeding crop by nutrients is the most important factor that help in increasing production per a unit of area, especially with phosphorus that has high importance in increasing corn yield and improving its quality due to its important functions within plant (Khademi *et al.*,2002) Nitrogen is also important nutrient to plant its needed at different stages of growth. It contributes in building protoplasm, proteins, enzymes, coenzymes, energy compounds and amino acids and proteins (Abu Dahi and Ghazi,2001). Available nitrogen face many processes resulted in reducing its availability as absorption by microorganism or change to ammonia especially in alkaline soil or lost through leaching and water erosion or can be fixed by clay minerals (2:1) (AL-Naimi, 1999).

The aims of this study were to study the effect of covering soil surface and irrigation levels on uptake of nitrogen, phosphorus and growth of corn plant (Zea mays L.).

Materials and Methods

The present study was conducted in the sunshade belong to Agricultural Research Station, College of Agriculture, University of Basrah Iraq. Soil was taken from the surface layer of Al-Hartha area, Basrah province. Soil samples were collected from study area before planting, dried, passes through a sieve of 2 mm and analyzed as shown in Table (1). Soil electrical conductivity EC (1:1) soil PH (1:1) cation exchang capacity and available phosphorus, soluble sulphates, sodium and potassium according methods mentioned in (Page *et al.*, 1982). Calcium carbonate was estimated by Jackson, (1958). Total nitrogen Bremner, (1970) and available nitrogen as by (Bremner and Edwards, 1965). Soluble calcium, magnesium, carbonate, bicarbonate and chloride of soil extract were estimated described by Richards, (1954). Field capacity was estimated by the method which described mentioned in to the by Black, (1965). Soil texture has been estimated by the method of Black, (1965). Experiment included of coverage and without coverage of field with black plastic and two levels of irrigation 60% of field capacity and 100% field capacity with the addition of 20% of water as leaching requirement. Three levels of nitrogen (0, 30 and 60 mg Nkg^{-1}) as urea (46 % N) and three level of phosphorus (0, 40 and 80 mg Pkg^{-1}) as concentrated super phosphate (20.21% P). Three replications were used and thus the number of experimental unite 2*2*3*3*3=108 units with pots were filled with 3 kg soil. Soil were planted with ten of corn grains (Zea mays L.) at 20/3/2013, soil were moisten up to field capacity plants were harvested after 60days .The plants weights recorded and dried at 70 °C in oven. Dry weight was recorded. Dry weight of plants shoots (0.2g) was digestion with 4%

$HClO_4$+H_2SO_4 according to Gresser and Parsons, (1979) Nitrogen was estimate by digestion and determined b kjeldhal method according to Bremnr (1970), phosphorus was determined colorimetric as mentioned by Gresser and parsons (1979). It was estimated total phosphorus in plant samples according to Murphy and Riley (1962), pot soil samples were dried and sieve by 2 mm diameter seize and analyzed for available phosphors as described in Black (1965), uptake of nitrogen and phosphate were calculate by multiplied dry matter with the concentration of nitrogen or phosphorus in the plant. The experiment was designed using a randomized complete design within factorial experiment and three replicates. Were used. The results statistically analyzed using variance analysis (AL- Rawi and Abdallah, 1980).

Results and Discussion

Effect of coverage and irrigation level on corn plant dry weight with different levels of nitrogen and phosphorus

Results in Tables (2) and (3) showed that these are significant effects of the different factors on the dry weight of corn plants. The covered treatments produced significantly ($P<0.05$) higher plants weights of 11.59 and 11.81 gm pot when applying nitrogen and phosphorus levels respectively, in comparison with uncovered the treatment which recorded 9.98 and 8.99 gm pot respectively, The reason behind that may due to the reduction in the evaporate water from soil surface and the increase in water and nutrients rate uptake by plants as well as covering limit the growth of bushes which compete with plants (Al-Abdallah, 2008). These results are in consistent with those of (Al-Asbahi, 2003).

Irrigation water levels affected ($P<0.05$) dry weight, as the levels 60% and 100% of field capacity exhibited means of 9.56 and 12.01 gm pot respectively for nitrogen and 9.74 and 11.06 gm pot, respectively for phosphorus. These results indicated that water has great effect on plant physiological processes, cell elongation, at a same time on photosynthesis and increasing water tension inside soil causes small leaf size and reduction of CO_2 synthesis, evaporation and transpiration (Hsiao, 1973). As well as water quantity affect root growth and development resulting in controlling absorption of water and nutrients (Shock and Feiber, 2002).

In connection with the impact of nitrogen, Table (2) showed significant ($P<0.05$) 60 mg N kg^{-1} level or the level of 30 mg kg^{-1} and the control treatment which recorded 12.27, 10.76 and 9.33gm pot^{-1} respectively. The increase of plant dry weight with increasing of fertilizer level due to the increase of vegetative growth through the direct effect on photosynthesis as it is part of chlorophyll molecule. These results were in consistent with those of Bablar *et al*., (2010) and Selim *et al*., (2010), who indicated that nitrogen level has positive significant effect on plant growth. Eltelib *et al*., (2006) mentioned that nitrogen has effective physiological role in crop growth and yield at all plants growth stages till the ideal yield. As well as Barker and Bryson, (2007) indicated that dry weight increases with increasing nitrogen levels because nitrogen is essential plant nutrient and the major part of protein.

Table (3) showed that the increase in phosphorus levels had significant ($P<0.05$) effect on plant dry weight. Plants received level of 0, 40 and 80 $mgkg^{-1}$ soil of phosphorus recorded a dry weight of 9.20, 10.38 and 11.63 $gmpot^{-1}$ respectively. This improvement could be due to the availability of phosphorus as a result of increasing levels of added phosphorus which increased plants uptake, as phosphorus plays important role in many physiological processes inside plant, production of nuclear acids, phospholipids, energy compounds and cell division. Those processes increased roots growth which improve uptake of nutrients and improvement of vegetative growth (Mengle and Kirkby, 1982). These results are in consistent with those of (Gelderman *et al*.,2004).

It is also found that covered soil with applying 100% of water field capacity revealed significant ($P<0.05$) improvement in vegetative dry weight in comparison with uncovered soil with 60% water field capacity, from 8.80 to 12.86 gm Pot^{-1} for nitrogen levels and from 8.53 to 12.67 gm pot^{-1} for phosphorus levels. As well as there was increase in dry weight of different levels of nitrogen and phosphorus with covered or uncovered soil (8.88-13.08 gm pot^{-1} for nitrogen levels and 7.79-13.15 gm pot^{-1}, respectively). Plant dry weight produced from of 100% water field capacity and 60 mg N kg^{-1} group was 13.17 gm pot^{-1} higher significantly ($P<0.05$) than that of 60% water field capacity and 0 kg h^{-1} (8.02 gm pot^{-1}). Same results were found in case of phosphorus application (12.11 and 8.39 gm.pot^{-1}). These results were in consistent with those of Hamdan (1982), he found an increase in corn dry weight at increasing moisture levels with all phosphate treatments.

All interactions among study treatments had significant ($P<0.05$) effect on dry weight, a group of covered soil, 100% water field capacity, 60 mg N kg^{-1} and 80 mg Kg^{-1} P (13.99 gm pot^{-1}) exceeded ($P<0.05$) a group of uncovered soil, 60% water field capacity, 0 N and 0 p (7.69 gm pot^{-1}).

Effect of soil coverage and irrigation levels on nitrogen concentration in corn under different levels of nitrogen and phosphorus

Table (4) showed a significant ($P<0.05$) positive effect of covering soil on plant nitrogen content (29.13 gm kg^{-1}) in comparison with uncovered (24.99 gm kg^{-1}). This result could be due to covering soil increases soil availability with increasing temperature, improvement of plants growth and efficiency of roots (Wien *et al*., 1993; Ali, 2001). These results are in consistent with those of (Siborlabane, 2000; Ahmed *et al*., 2009).

Irrigation had significant ($P<0.05$) effect on nitrogen concentration in corn plants with 100% field capacity group recorded a concentration of 29.81 gm kg^{-1}compared with 24.31gm kg^{-1} recorded by a group of 60% field capacity (Table, 4).

Increasing level of urea added to the soil had significant ($P<0.05$) effect on plants nitrogen content, as levels 0, 30 and 60 mg N kg^{-1}revealed nitrogen concentrations of 14.44, 32.14 and 34.60 gm kg^{-1}, respectively. These results were similar to that of (Carpici and Bayram (2010) and Hussam *et al.,* (2012) who indicated an increase in nitrogen concentration of corn plants with increasing nitrate fertilizer. Covered soil with 100% field capacity resulted in a significant ($P<0.05$) higher concentration of nitrogen than uncovered group with 60% field capacity (32.57 and 22.93 gm kg^{-1} respectively). Similar trends were shown by a group of covered soil and 60 mg N kg^{-1}which exceeded ($P<0.05$) all other groups with a value of 37.80 gm kg^{-1}. However, a group of uncovered soil and 60 kg Nha^{-1} recorded the lowest nitrogen concentration (13.48 gm kg^{-1}). At the same time, a group of 60 mg kg^{-1} nitrogen and irrigation 100% field capacity has exceeded other groups of nitrogen levels with a mean of 38.40 gm kg^{-1} in comparison with 0 mg N $kg^{-1}$and irrigation at 60% field capacity with an average of 13.35 $gmkg^{-1}$. Therefore, interaction among the three factors has revealed that covered soil planted at nitrogen level of 60 mg N kg^{-1} and irrigation of 100% field capacity gave highest average level of nitrogen 43.00 gm kg^{-1} in comparison with a group of 0 mg N kg^{-1} with 60% field capacity (12.50 gm kg^{-1}).

This might explain that covering might allow appropriate level of moisture, reduced evaporation from soil surface and contributed in reducing osmotic problems resulted from less water availability (Cadavid *et al.,* 1998). As well as, it prevent nitrogen loss, encourage microorganism growth and balance soil temperatures (Romic *et al*., 2003).

Effect of coverage and irrigation level on P concentration of corn plants under different levels of phosphate fertilizer

It can be noticed from Table (5) the superiority of covered on uncovered soil in P concentration of corn plants (3.22 and 2.20 gm kg^{-1}, respectively). In case of irrigation, values has increased with increase of irrigation levels (3.30 and 2.12 gm kg^{-1} for 100% and 60% field capacity, respectively). The reason behind that might be due to the positive relation between irrigation levels and plant growth because water has important role in most metabolism activities in plants, as water diminishing cause less growth in upper parts of plants and leaf growth. This followed by reduction in cell wall formation and protein and reduction in cell division followed by decrease nutrients intake plant ability (Al-Naimi *et al.,* 1999). These results are in agreement with those of Abdallah, (2014), who indi cated an increase of P intake by plant when soil moisture increases.

In case of adding different level of P effect, Table (3) showed the superiority of P concentration with increasing P level 0, 40, 80 mg Pkg^{-1} (1.02, 3.32 and 3.80 gmkg^{-1}, respectively). The reason behind that might be the increase of P levels added to the soil led an improvement in plants growth and increasing in the ability to intake P from soil which reflected on its levels in vegetative part. Covered soil with 100% field capacity exceeded significantly ($P<0.05$) the group of uncovered soil with 60% field capacity (4.00 and 1.79 gm kg^{-1}, respectively). Covered soil and fertilized by 80 mg kg^{-1} P showed highest level of P (4.35 gm kg^{-1}) in comparison with the uncovered soil with 0 mg kg^{-1} P which gave the lowest value (0.73 gm kg^{-1}). The group of 80 mg kg^{-1} with irrigation at 100% field capacity also revealed highest value (5.13 gm kg^{-1}) in comparison with 0.69 gm kg^{-1} shown by 0 mg kg^{-1} P and irrigation at 60% field capacity.

Effect of coverage and irrigation level on nitrogen uptake by corn plants under different level of nitrogen fertilizer

Table (6) showed that soil covered by black plastic exceeded significantly ($P<0.05$) uncovered soil and gave a level of 354.65 mg pot^{-1} of absorbed nitrogen, that of uncovered group was 259.47 mg pot^{-1}. Increase absorbed nitrogen in case of covered soil might be due to increase in nitrogen metal in soil (Abdul-Kareem *et al.*, 2012). Wien *et al.,*(1993) also indicated that increasing temperature of covered soil increase roots ability to absorb water and nutrients, which reflected positively in strength of root and vegetative and production of hormones as gibberellins and cytokines. Yoder, (1993) concluded that liberation of gas in soil and stay under the cover increase the availability of N, P, K and intake by plant. Table (6) also showed a significant ($P<0.05$) effect of irrigation level on nitrogen uptake. A group of 100% field capacity exceeded the group of 60% field capacity (243.53 and 370.59 mg pot^{-1} respectively).

Level of urea 0, 30 and 60 mg kg^{-1} increased level of nitrogen uptake 138.01, 352.82 and 430.35 mg, respectively (Table, 6). These changes were due to the variation in total mental nitrogen (Abdul-Kareem *et al*., 2012) which reflected positively on nitrogen absorbed by plant. These results are with full agreement with those of (Choudhury and

Kennedy, 2005; Hussam *et al.,*2012), who observed an increase in absorbed nitrogen by corn with the increase in levels of fertilizer added.

Table (6) also indicates the existence of interaction between covering and irrigation level on nitrogen intake, as covered soil irrigated with 100% field capacity exceeded other groups with an average of 432.61 mg pot^{-1}. While uncovered soil at 60% field capacity group gave a mean of 210.37 mg pot^{-1}. There were also significant differences between covered soil and levels of fertilization, a covered soil fertilized with 60 mg kg^{-1} of P exceeded other group by nitrogen intake with an average of 499.00 mg pot^{-1} in comparison with 123.75 mg pot^{-1} revealed by uncovered soil with control treatment . These differences were also shown by irrigation level of 100% field capacity and fertilized with 60 mg kg^{-1} and the group of 60% field capacity and 0 N which revealed 509.50 and 110.28 mgpot^{-1} respectively. Finally the interaction among the three factors showed significant effect ($P<0.05$) (table 6). The group of covered soil with 100% field capacity irrigation and nitrogen level of 60 mg kg^{-1} exceeded other groups and recorded a mean of 417.43 mg pot^{-1} in comparison with 118.43 mgpot^{-1}shown by the group of uncovered soil 60% field capacity and control treatment.

Effect of coverage and irrigation level on P uptake by corn plants fertilized with different levels of phosphate

Table (7) showed that covering soil had significant ($P<0.05$) effect on P uptake by corn, with the superiority of covered soil significantly ($P<0.05$) with an average of 40.76 mg.pot^{-1} while uncovered group gave 20.91 mgpot^{-1}.An increase of irrigation level rises significantly ($P<0.05$) P uptake at both levels (Table, 7). It was observed that P uptake increased from 22.11mg pot^{-1} to 39.56 mg pot^{-1} of the levels of 60 and 100% field capacity, respectively. The reason behind that is as water rises causes an increase in moisture soil size and area and consequently an increase in the root spreading and distribution due to the availability of moisture, get rid of salinity far from root group and increase of moisture which caused an increase availability of P in soil and rises consequently increase P uptake by plants. These results are in agreement with what observed by Gal and Dudley (2005), addition of water continuously caused increases viability of P in soil solution. Table (7) also showed that an increase level of phosphate fertilizer affected P uptake level significantly ($P<0.05$) with an averages of 10.14, 35.83 and 46.55 mg pot^{-1} for 0, 40 and 80 mg pot^{-1} of P respectively. An increase in available P level and plant dry weight reflected positively on P uptake by plants (Al-Timimi, 1993). Many researchers indicated that an increase in P fertilizer level caused an increase in yield and P intake (Borges and Mallarino, 2003; Mallarino and Dodd, 2005).

An interaction between soil covering and irrigation has shown a significant ($P<0.05$) effect on P uptake with a superiority of covered and 100% field capacity group over all other groups, it recorded 53.38 mg pot^{-1}at 16.09 mgpot^{-1} revealed by the group of uncovered soil with 60% field capacity. Covered soil fertilized by 80 mg kg^{-1} group recorded highest P uptake of 60.37 mgpot^{-1} in comparison with 5.66 mg pot^{-1} recorded by uncovered soil with 0 P mg kg^{-1}.As well as fertilized group with 80 mg kg^{-1} P with irrigation at 100% field capacity exhibited significant mean of 58.25 mg pot^{-1}or 5.98 mg pot^{-1} mean of 0 mg kg^{-1} with 60% field capacity group.

From interaction between different factors used in this study, it is clear that covering soil irrigated with 100% field capacity and fertilized with 80 mg Kg^{-1} showed the highest ($P<0.05$) P uptake

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with an average of 76.64 mg pot^{-1}. However, P intake of uncovered soil with an irrigation level of 60% field capacity unfertilized with 0 P $mg.Kg^{-1}$ was the lowest with an average of 5.05 $mgpot^{-1}$.

Conclusion

It can be concluded from the above results the efficiency of soil covers in increasing concentration and quantity of nitrogen and phosphate intake by corn plants which reflected positively on plant dry weight at the end of agricultural season in comparison with uncovered group. A present of these covers in salty soil with cheap prices encourage its use in arid and semi arid regions.

Table 1. Some physical and chemical properties of the soil before planting

Soil properties	Units	Value
pH (1:1)		7.6
EC (1:1)	dSm^{-1}	6.3
$CaCO_3$	$gmkg^{-1}$	395.5
CEC	$Cmole^{+}kg^{-1}$	15.30
Organic Matter	$gmkg^{-1}$	4.15
Total nitrogen	$gmkg^{-1}$	0.30
P available	mg kg^{-1}	22.85
Ca^{++}	($mmoll^{-1}$) Dissolved Ions	10.30
Mg^{++}		11.25
Na^{+}		18.30
K^{+}		2.14
$CO_3^{=}$		0
$HCO_3^{=}$		4.25
Cl^{-}		22.40
$SO_4^{=}$		16.15
F. C 100%	%	31.0
F .C 60%	%	16.0
S . P	%	40
Sand	$gmkg^{-1}$	60.0
Silt		420.0
Clay		520.0
Texture		Silty clay

Table 2. Effect of coverage and irrigation on the dry weigh (gm pot^{-1}) for growing corn plant under different levels of nitrogen.

Coverage	Irrigation level	nitrogen level mg Nkg^{-1}			
		0	30	60	Coverage × Irrigation level
With coverage	60% field capacity	8.34	10.42	12.16	10.31
	100% field capacity	11.21	13.39	13.99	12.68
Without coverage	60% field capacity	7.69	8.17	10.55	8.08
	100% field capacity	10.06	11.03	12.35	11.15
					Coverage
Coverage × N level	Mulched	9.78	11.91	13.08	11.59
	Unmatched	8.88	9.60	11.45	9.98
					Irrigation level
Irrigation level × N level	60% field capacity	8.02	9.30	11.36	9.56
	100% field capacity	10.64	12.21	13.17	12.01
The level of N rate		9.33	10.76	12.27	

Least significant difference at a level of 0.05 (L.S.D)

Coverage	Irrigation level	N level	Coverage × irrigation level	Irrigation × N level	Coverage × N level	Coverage× irrigation × N level
2.50	2.60	2.00	2.80	2.10	2.50	2.90

Table 3. Effect of coverage and irrigation on the dry weigh (gmpot^{-1}) for growing corn plants under different levels of phosphorus.

Coverage	Irrigation level	Phosphorus level mg P kg^{-1}			
		0	40	80	Coverage × Irrigation level
With coverage	60% field capacity	9.46	11.03	12.35	10.95
	100% field capacity	11.75	12.33	13.94	12.67
Without coverage	60% field capacity	7.32	8.35	9.92	8.53
	100% field capacity	8.25	9.78	10.27	9.43
					Coverage
Coverage × Plevel	Mulched	10.61	11.68	13.15	11.81
	Unmatched	7.79	9.07	10.10	8.99
					Irrigation level
Irrigation level × P level	60% field capacity	8.39	9.69	11.14	9.74
	100% field capacity	10.00	11.06	12.11	11.06
The level of P rate		9.20	10.38	11.63	

Least significant difference at a level of 0.05 (L.S.D)

Coverage	**Irrigation level**	**P level**	**Coverage × irrigation level**	**Irrigation × P level**	**Coverage × P level**	**Coverage× irrigation × P level**
3.55	2.10	2.90	1. 80	1.20	1.75	2.50

Table 4. Effect of coverage and irrigation on the concentration of nitrogen (gm kg^{-1}) of cornplants grown under different levels of nitrogen.

Coverage	Irrigation level	nitrogen level mg Nkg^{-1} 0	30	60	Coverage × Irrigation level
With coverage	60% field capacity	14.20	30.25	32.60	25.68
	100% field capacity	16.60	38.10	43.00	32.57
Without coverage	60% field capacity	12.50	27.30	29.00	22.93
	100% field capacity	14.45	32.90	33.80	27.05
					Coverage
Coverage × N level	Mulched	15.40	34.18	37.80	29.13
	Unmatched	13.48	30.10	31.40	24.99
					Irrigation level
Irrigation level × N level	60% field capacity	13.35	28.78	30.80	24.31
	100% field capacity	15.53	35.50	38.40	29.81
The level of N rate		14.44	32.14	34.60	

Least significant difference at a level of 0.05 (L.S. D)						
Coverage	Irrigation level	N level	Coverage × irrigation level	Irrigation × N level	Coverage × N level	Coverage× irrigation × N level
5.14	6.60	18.20	6.50	4.90	4.30	5.90

Table 5. Effect of coverage and irrigation on the concentration of nitrogen (gm kg^{-1}) of corn plants grown under different levels of phosphorus.

Coverage	Irrigation level	Phosphorus level mg P kg^{-1} 0	40	80	Coverage × Irrigation level
With coverage	60% field capacity	0.73	3.03	3.57	2.44
	100% field capacity	1.90	4.96	5.13	4.00
Without coverage	60% field capacity	0.69	2.11	2.58	1.79
	100% field capacity	0.76	3.18	3.88	2.61
					Coverage
Coverage × P level	Mulched	1.32	4.00	4.35	3.22
	Unmatched	0.73	2.65	3.23	2.20
					Irrigation level
Irrigation level × P level	60% field capacity	0.71	2.57	3.08	2.12
	100% field capacity	1.33	4.07	4.51	3.30
The level of P rate		1.02	3.32	3.80	

Least significant difference at a level of 0.05 (L.S.D)						
Coverage	**Irrigation level**	**P level**	**Coverage × irrigation level**	**Irrigation × P level**	**Coverage × P level**	**Coverage× irrigation × P level**
1.30	1.90	2.80	1.50	1.20	1.90	1.60

Table 6. Effect of coverage and irrigation on quantity of nitrogen uptake(mg pot^{-1}) of corn plants grown under different levels of nitrogen.

Coverage	Irrigation level	nitrogen level mg Nkg^{-1}			
		0	30	60	Coverage × Irrigation level
With coverage	60% field capacity	118.43	315.21	396.42	276.69
	100% field capacity	186.09	510.16	601.57	432.61
Without coverage	60% field capacity	102.13	223.04	305.95	210.37
	100% field capacity	145.37	362.89	417.43	308.56
					Coverage
Coverage × N level	Mulched	152.26	412.69	499.00	354.65
	Unmatched	123.75	292.97	361.69	259.47
					Irrigation level
Irrigation level × N level	60% field capacity	110.28	269.13	351.19	243.53
	100% field capacity	165.73	436.53	509.50	370.59
The level of N rate		138.01	352.83	430.35	

Least significant difference at a level of 0.05 (L.S.D)						
Coverage	Irrigation level	N level	Coverage × irrigation level	Irrigation × N level	Coverage × N level	Coverage× irrigation × N level
98.20	150.80	220.00	124.50	80.20	90.10	90.80

Table 7. Effect of coverage and irrigation on quantity of nitrogen uptake(mg pot^{-1}) of corn plants grown under different levels of phosphorus.

Coverage	Irrigation level	Phosphorus level mg P kg^{-1}			
		0	40	80	Coverage × Irrigation level
With coverage	60% field capacity	6.90	33.42	44.09	28.14
	100% field capacity	22.33	61.16	76.64	53.38
Without coverage	60% field capacity	5.05	17.62	25.59	16.09
	100% field capacity	6.27	31.10	39.85	25.74
					Coverage
Coverage × P level	Mulched	14.62	47.29	60.37	40.76
	Unmatched	5.66	24.36	32.72	20.91
					Irrigation level
Irrigation level × P level	60% field capacity	5.98	25.52	43.84	22.11
	100% field capacity	14.30	46.13	58.25	39.56
The level of P rate		10.14	35.83	46.55	

Least significant difference at a level of 0.05 (L.S.D)						
Coverage	**Irrigation level**	**P level**	**Coverage × irrigation level**	**Irrigation × P level**	**Coverage × P level**	**Coverage× irrigation × P level**
20.80	18.50	11.20	26.50	13.00	14.10	17.25

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تأثير تغطية سطح التربة ومستوى الري على سلوك عنصري النتروجين والفسفور ونمو نبات الذرة الصفراء (.*Zeamays L*)

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الملخص

أجريت التجربة في محطة البحوث الزراعية بمنطقة كرمة علي التابعة لكليه الزراعة في محافظة البصرة أثناء الموسم الزراعي ٢٠١٣-٢٠١٤ على محصول الذرة الصفراء لدراسة تأثير تغطية التربة بالبلاستيك الاسود ومعاملة بدون تغطية ومستويين في الري (اضافة ٦٠% من الماء عند السعة الحقلية و١٠٠% من الماء عند السعه الحقلية, وثلاث مستويات من النتروجين ($0,30, 60$ kg mg N kg^{-1}) بهيئة سماد اليوريا (٤٦% نتروجين) وثلاث مستويات من الفسفور($0,40,$ and 80 mg pkg^{-1}) على هيئة سماد سوبر فوسفات مركز (٢٠,٢١ % فسفور) قسمت الأصص إلى مجموعتين قسم مغطاة والقسم الاخر بدون تغطية، ثم زرعت حبوب الذرة الصفراء بواقع عشر حبات لكل أصيص ثم رويت التربة المزروعة بالماء بما يعادل السعة الحقلية حتى نجاح الانبات. رتبت الأصص جميعها للمعاملات المختلفة ترتيباً عشوائياً ، بعد انبات الحبوب خفت الى خمس نباتات لكل اصيص، وقد استمر الري خلال مدة الزراعة بعد انخفاض مستوى الرطوبة في التربة الى اقل من السعة الحقلية التي استدل عليها من خلال الفرق في الوزن بين الوزن عند السعة الحقلية للاصيص وبعد انخفاض الوزن بالفقد. حصدت النباتات بعد ٦٠ يوم من الزراعة ثم جففت بالفرن على درجة حرارة ٦٥ مْ حتى ثبات الوزن الجاف للنبات، سجل الوزن الجاف للجزء الخضري والجذري بعد ذلك قطعت وطحنت العينات النباتية ونخلت بمنخل سعة فتحاته ١ملم، ثم قدر تركيز النتروجين والفسفور وحسبت الكمية الممتصة لعنصري النتروجين والفسفور في نهاية الموسم الزراعي. اظهرت النتائج ان معاملات التغطية ادت الى زيادة الوزن الجاف للجزء الخضري لنبات الذرة الصفراء وزيادة الكمية الممتصة من عنصري النتروجين والفسفور وتفوق مستوى الري ١٠٠% عند السعه الحقلية على المستوى ٦٠% عند السعه الحقلية واوضحت النتائج ان زيادة مستويات النتروجين والفسفور المضافة ادت الى الزيادة المعنوية في الوزن الجاف والتركيز والكمية الممتصة للنتروجين والفسفور.

الكلمات المفتاحية: *التغطية، مستوى الري ، نتروجين، فسفور.*