



Impact of urea coated with rice bran on the nitrogen absorption and economic feasibility of wheat crop.

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Abstract

A field experiment was conducted during the winter season 2023-2024, at the Second Agricultural Research and Experiment Station, to study the effect of urea coated with rice bran on nitrogen absorbed and the economic feasibility of wheat crop. It included coating treatments (0, 10, 20 and 40% rice bran coating treatment), with several wheat varieties (Buhuth 22, Al-Shimaa, Al-Karm and Axad 1133). The experiment was conducted using Randomized Complete Block Design R.C.B.D according to the split-plot method and in three blocks, the coating treatments were placed in the main plots and the varieties in the sub-plots. Treatment C3 gave the highest nitrogen concentration in the tillering and flowering stages, also, the highest total revenue and net profit. The V3 variety gave the highest nitrogen concentration in the tillering, lining and flowering stages, the highest total revenue and net profit, urea fertilizer coating with sapwood led to a reduction in the amount of fertilizer used, compared to the amount of fertilizer in the non-addition treatment, which reduced production costs and increased the economic return.

Key words: urea coated, rice bran, nitrogen absorption, economic feasibility, wheat crop.

Introduction

Wheat is considered one of the basic crops for many people in the world. In addition to the presence of lipids, vitamins, certain minerals, and essential amino acids that are required by the human diet, the fundamental reasons for the nutritional relevance of wheat are the high quantities of carbohydrates and proteins that are present in wheat grains. Wheat also contains a number of other nutrients that are essential to human nutrition [1]. Wheat belongs to the Poaceae family because it contains gluten protein used in bread making [2].

The productivity of wheat crop depends on many factors, including the amount of nutrients in the soil. The most important of these elements is nitrogen, which is considered one of the important elements, because of its role in increasing plant growth and productivity [3].

The plant's needs for nutrients vary according to the growing season, soil type, and growth stages. There is also a strong correlation between the stages of plant growth and its requirements for nutrients [4].

Urea fertilizer is used as a source of nitrogen due to its high nitrogen content and low production cost [5]. Urea fertilizer

is exposed to loss processes due to volatility, washing, nitrification and reverse nitrification, therefore, coated fertilizers were used. They slow down the release of nitrogen and thus give the highest yield. The economic feasibility study is considered a scientific means to evaluate the probability of success of an agricultural research idea before its actual implementation. It also helps the investor identify the necessary financial resources, as economic feasibility shows the most important weaknesses and risks [6].

The aim of the economic feasibility study is to reduce production costs and choose the best project with satisfactory results from among the available projects.

Material and methods

Soil service operations

The experimental land was plowed to a depth of approximately 30 cm, which was followed by smoothing and leveling. The land was then divided into experimental units with dimensions of (2×2=4 m), each of which contained ten lines with a length of 2 m and a distance of 20 cm between each line. In total, there were 48 experimental units. The seeds of wheat varieties were planted on 20/11/2023, with 16 experimental units in each block, at a seed rate of 120 kg ha⁻¹ in accordance with the coating ratios. The

experimental units were distributed over three sectors.

Coated urea fertilizer was added (after emergence) and 100 kg P₂O₅ ha⁻¹, by the form of triple superphosphate fertilizer (20%P), one time at planting, and 60 kg K ha⁻¹ [7], of the land before planting, in one batch, and the two types of Buhuth 22, and the Karam variety, were harvested

on 4/4/2024, while the Al-Shaimaa variety and the AXAD 1133 variety were harvested on 12/4/2024.

Chemical and physical soil analysis:

The samples were combined to produce a composite sample that accurately represented the field soil after they were randomly collected from the field soil at a depth of 30 cm. In order to conduct a chemical and physical analysis of the soil, the sample was air dried and ground (Table 1).

Table (1) Some physical and chemical properties of field soil.

Items	Value	Unit
pH	8.00	
E.C.E	7.40	ds m ⁻¹
Available Nitrogen	11.20	mg kg ⁻¹ soil
Available Phosphorus	12.30	mg kg ⁻¹ soil
Available Potassium	176.00	mg kg ⁻¹ soil
Organic matter	0.60	g kg ⁻¹ soil
Sand	45.00	
Silt	24.00	g kg ⁻¹ soil
Clay	31.00	
Soil texture	Sandy clay soil	

Nitrogen concentration in plants:

Plant samples were collected to determine the efficiency of coated fertilizers in providing nitrogen during different growth stages and based on the Zadoks decimal scale [8] to describe the stages of grain growth; The tillering stage

(the main stem is one branch). The lining stage (the lining is visibly swollen) and the flowering stage.

Economic feasibility:

Fixed costs (ID ha⁻¹):

Calculated by calculating land rent and family labor [9].

Variable costs (ID ha⁻¹):

By calculating land preparation costs from planting to harvesting, fertilizer costs, coating fees, and marketing costs.

Revenues from the crop (ID ha-1):

Calculated by the following equation:

Wheat crop revenue = Production quantity in tons \times 850,000 dinars.

as a result of the fact that the price of one tonne of wheat is 850,000 Iraqi dinars...

Straw revenues (ID ha-1):

Calculated using the following equation:

Straw revenues (hay) = number of bales \times 1500 dinars.

According to the information provided by the local market, the cost of a single bale of straw (hay) is 1500 dinars; thus, this is the price that this business is charging.

Total revenue (ID ha-1):

Calculated using the following equation:

Total revenue = Grain yield revenue + Straw revenue (hay).

Total costs (ID ha-1):

Calculated using the following equation:

Total costs = Fixed costs + Variable costs.

Net profit (ID ha-1):

Calculated using the following equation:

Profit = Total revenue - Total costs

Results and Discussion

Plant Analysis:

Nitrogen Concentration in the Tillage Stage:

Based on the results of the statistical analysis, it was shown that the coating treatments, varieties, and the interaction between the two had a significant influence on the nitrogen concentration during the tillage stage.

Table (2) shows a significant effect between the different coating treatments, Treatment C3 outperformed by giving the highest average (13.712 mg kg⁻¹). while coating treatment C1 recorded the lowest average (11.150 mg kg⁻¹), this result agreed with Al-Burki [10].

Table (2) demonstrated a substantial difference in nitrogen content among the varieties during the tillering stage, with V3 exhibiting the greatest average at 13.552 mg kg⁻¹, while V2 recorded the lowest average at 12.117 mg kg⁻¹.

The results of the same table indicated a substantial interaction impact between the coating treatments and the varieties. The combination (C3*V3) yielded the greatest average at 15.167 mg kg⁻¹,

whereas the combination (C1*V2) produced the lowest average at 10.833 mg kg⁻¹.

Table (2) The effect of coated urea and the varieties and their interaction on the nitrogen content characteristic in the plant in the tillering stage (mg kg⁻¹).

Coated treatments	Varieties				Coated mean
	V1	V2	V3	V4	
C1	10.933	10.833	11.700	11.133	11.150
C2	12.733	13.000	13.677	13.033	13.111
C3	13.647	12.967	15.167	13.067	13.712
C4	12.133	11.667	13.667	12.000	12.367
Varieties mean	12.362	12.117	13.552	12.308	
L.S.D _{0.05}	Coated treatments		Varieties		Interaction
	0.68		0.48		1.01

Nitrogen concentration in the lining stage (mg kg⁻¹):

During the lining stage, it was established that the coating treatments, varieties, and the interaction between them had a significant impact on the nitrogen content. This conclusion was reached on the basis of the findings of the statistical analysis.

Table (3) reveals substantial variations during the lining stage, with treatment C4 achieving the highest average (19.58 mg kg⁻¹), whereas coating treatment C1 recorded the lowest average (13.58 mg kg⁻¹). The superiority of the comparison treatment is attributed to its ability to provide a large amount of nitrogen and convert it into protein and

spikelet formation, this result differed with Al-Burki [10].

The results of the identical table indicated a substantial impact on the varieties that were incorporated into the experiment. In comparison, V1 produced the lowest average (16.00 mg kg⁻¹), while V3 was preferable and produced the highest average (18.67 mg kg⁻¹).

The findings suggested that the coating treatments and the variants exhibited substantial variations. The combination (C4*V3) was the most effective and produced the highest average (22.00 mg kg⁻¹), while the combination (C1*V1) produced the lowest average (13.00 g kg⁻¹).

Table (3) The effect of coated urea and varieties and their interaction on the nitrogen content trait in the plant at the lining stage (mg kg⁻¹).

Coated treatments	Varieties				Coated mean
	V1	V2	V3	V4	
C1	13.00	13.33	14.00	14.00	13.58
C2	15.33	15.67	17.00	17.67	16.42
C3	16.67	18.00	21.67	18.00	18.58
C4	19.00	18.33	22.00	19.00	19.58
Varieties mean	16.00	16.33	18.67	17.17	
L.S.D _{0.05}	Coated treatments		Varieties		Interaction
	0.74		0.70		1.36

Nitrogen concentration in flowering stage (mg kg⁻¹):

The findings of the statistical analysis led to the conclusion that coating treatments, varieties, and the interaction between them had a significant influence on the nitrogen content during the blooming stage. This conclusion was reached based on the findings of the analysis.

Table (4) demonstrates the existence of substantial disparities in coating treatments. Coating treatment C3 produced the greatest average (23.50 mg kg⁻¹), while treatment C2 produced the lowest average (21.75 mg kg⁻¹). The superiority of treatment C3 may be attributed to its efficiency in providing nitrogen for long periods during the plant growth stage, as it is known that during the flowering stage, the plant is at the peak of

its vital and physiological processes and photosynthesis is at its highest rates, thus, the plant's demand for nitrogen absorption increases.

The results indicated that the nitrogen concentration trait in the blossoming stage varied significantly among the varieties. V3 exhibited the highest average (22.67 mg kg⁻¹), while V1 exhibited the lowest average (20.50 mg kg⁻¹).

The findings indicated that the coating treatments and varieties were significantly different. The combination (C3*V3) outperformed and achieved the highest average (26.33 mg kg⁻¹), while the combinations (C1*V1) and (C1*V2) achieved the lowest averages (19.00 and 19.00 mg kg⁻¹, respectively).

Table (4) Effect of coated urea and varieties and their interaction in the nitrogen content trait in the plant at the flowering stage (mg kg⁻¹).

Coated treatments	Varieties				Coated mean
	V1	V2	V3	V4	
C1	19.00	19.00	19.67	20.00	19.42
C2	21.00	20.33	22.67	23.00	21.75
C3	21.00	23.00	26.33	23.67	23.50
C4	21.00	22.00	22.00	22.33	21.83
Varieties mean	20.50	21.08	22.67	22.25	
L.S.D _{0.05}	Coated treatments		Varieties		Interaction
	1.06		0.72		1.53

Economic feasibility:

By-product revenue (straw) Dinars ha⁻¹,
calculated from the following equation:

Straw revenue = Number of presses ×
1500 Dinars

owing to the fact that the price of a single
press is equivalent to one thousand five
hundred dinars in accordance with the
market in the area

Table (5) The effect of coated urea and varieties and the interaction between them on by-product revenue (straw) (thousand Dinars ha⁻¹).

Coated treatments	Varieties				Coated mean
	V1	V2	V3	V4	
C1	964.8214	866.7857	955.6071	851.4642	909.6428
C2	924.1071	962.25	932.1428	778.5	899.25
C3	840.9642	813.5357	1,237.071	846.1071	934.2855
C4	897.6428	1,008.428	696.2142	885.3214	871.9285
Varieties mean	906.857	912.75	955.178	840.428	

Revenue of the crop (Dinars ha⁻¹):

This is the price that is currently being offered.

It was calculated using the following equation:

Wheat crop revenue = Production quantity in tons × 850 dinars.

There is currently a market price of 850,000 Iraqi dinars for a ton of wheat.

Table (6) The effect of coated urea and varieties and the interaction between them on the characteristic of the revenue of the grain crop (thousand dinars ha⁻¹).

Coated treatments	Varieties				Coated mean
	V1	V2	V3	V4	
C1	3059.15	2990.3	3496.9	2743.8	3072.75
C2	2723.4	2842.4	3690.7	2500.7	2939.3
C3	3131.4	3569.15	5008.2	3384.7	3773.15
C4	2951.2	3116.95	3504.55	2931.65	3126.3
Varieties mean	2966.5	3129.7	3925.3	2890	0

Total revenue (Dinars h⁻¹):

Table (7) indicates that there are differences between coating treatments in this trait, as coating treatment C3 gave the highest average (4707.435 Dinars ha⁻¹), while coating treatment C2 gave the lowest average (3838 Dinars ha⁻¹). It is probable that the superiority of treatment C3 can be attributed to the fact that it is superior in terms of plant height, flag leaf area, number of tillers, number of spikes, weight of 1000 grains, and grain yield. Another

possible explanation is that treatment C3 is superior in terms of overall plant height.

It is noted from the results of the same table that there were differences among varieties, as variety V3 gave the highest average of (4880.478 Dinars ha⁻¹), while variety V4 gave the lowest average of (3730.428 Dinars ha⁻¹).

The results showed a table of differences in the interaction between the factors involved in the experiment. The combination (C3*V3) gave the highest average (5009.43 dinars ha⁻¹), while the combination (C4*V2) gave the lowest average of (3117.958 dinars ha⁻¹).

Table (7) The effect of coated urea and the varieties and the interaction between them on the total revenue characteristic (thousand dinars ha-1).

Coated treatments	Varieties				Coated mean
	V1	V2	V3	V4	
C1	4023.971	3857.0857	4452.507	3595.264	3982.392
C2	3656.507	3804.65	4622.842	3279.2	3838
C3	3972.364	4382.685	5009.437	4230.807	4707.435
C4	3848.842	3117.958	4200.764	3816.971	3998.228
Varieties mean	3873.357	4042.45	4880.478	3730.428	0

Fixed costs (Dinars ha-1):

Independent of production costs are those that must be paid regardless of the volume of output and regardless of whether or not there is a profit or loss. These costs remain the same regardless of whether or not there is a profit. Regardless of whether or not there is a profit, these

expenses have to be paid before anything else. These costs are costs that are not changed by the amount of output that is created; therefore, it is required to pay them regardless of the level of output that is produced.

Table (8) Fixed costs thousand dinars ha-1.

Cost Item	Thousand dinars acre	Thousand dinars ha ⁻¹
Land Rent	20	80
Family Business	10	40
Total	30	120

Variable costs (ID ha-1):

There are costs associated with the production of goods or services that change depending on the activity of the

company or organization. These costs are referred to as variable costs. to pay them regardless of the level of output that is produced.

Table (9) Variable costs thousand dinars (ID ha-1).

Cost Item	Thousand dinars acre	Thousand dinars ha ⁻¹
Plowing	25	100
Smoothing	10	40
Leveling	15	60
Seeds 30 kg/acre	25.5	102
Seeding and Urea Coating Fees	15	60
Harvest	15	60
Total	70	422

Total Cost (Dinars ha-1):

Table (10) shows that there was a difference between the coating treatments, as coating treatment C1 gave the highest average total cost (820.72 Dinars ha-1), while coating treatment C2 gave the lowest average total cost (274.38 Dinars ha-1).

The results of the same data indicated that there was a discrepancy among the varieties. Variety V3 exhibited the highest

average total cost (254.71 Dinars ha-1), while variety V4 had the lowest average total cost (897.2571 Dinars ha-1).

The results indicate that the interaction among the factors involved in the experiment was distinct. The combination (C1*V3) resulted in an average total cost of 837.96 dinars ha-1, while the combination (C3*V2) had the lowest average of 216.94 dinars ha-1.

Table (10) The effect of coated urea and the types and the interaction between them on the total costs (thousand dinars ha-1).

Coated treatments	Varieties				Coated mean
	V1	V2	V3	V4	
C1	835.275714	773.142857	837.9686	801.3371	820.7214286
C2	278.468571	256.6	291.9914	237.02	274.38
C3	261.097143	216.942857	388.8057	265.4486	293.5614286
C4	274.091429	268.914286	226.8871	270.5757	269.2942857
Varieties mean	241.828571	243.4	254.7143	224.1143	

Net profit (Dinars ha-1):

Table (11) shows a difference between coating treatments, as coating treatment C3 gave the highest average (4413.87 Dinars ha-1), while coating treatment C1 gave the lowest average (3161.67 Dinars ha-1). One possible explanation for this is that the coating treatment C3 resulted in the highest average grain yield. This is something that could be the cause of this phenomenon. As a consequence of this, there was an increase in total income (Table 7) in comparison to costs (Table 10), which ultimately led to an increase in net profit.

The results indicated a disparity across the varieties, with variety V3 yielding the highest average (4625.76 Dinars ha-1) and

variation V4 yielding the lowest average (3506.31 Dinars ha-1).

The table's results indicate that the coating treatments and the varieties interact differently. The average (5856.46 dinars ha-1) was achieved by the combination (C3*V3), while the lowest average (2793.92 dinars ha-1) was achieved by the combination (C1*V4). There is a possibility that this might be explained by the fact that the combination of rice bran with a coating treatment of forty percent and the Al-Shimaa variety generated the greatest average total revenues (Table 7). One possible explanation for why this took place is that this is the case. Consequently, this led to an increase in net profit as a consequence of the fact that total sales were higher than total operational expenses. This was the result of the situation. This occurred as a direct result of the increase in overall revenues that were brought in.

Table (11) The effect of coated urea and varieties and the interaction between them on net income (profit) (thousand dinars ha-1).

Coated treatments	Varieties				Coated mean
	V1	V2	V3	V4	
C1	3188.695286	3083.943	3614.538529	2793.927	3161.671371
C2	3378.038429	3548.05	4330.851371	3042.18	3564.17
C3	3711.266857	4165.743	5856.465286	3965.359	4413.874071
C4	3574.750571	3856.464	3973.877057	3546.396	3728.934214
Varieties mean	3631.528429	3799.05	4625.763714	3506.314	

References:

- [1] Ali, H.K.M. and H.T. Ahmed (2017). Effect of components and yield of bread wheat grains on potassium spraying dates and salinity of irrigation water. *Diyala Journal of Agricultural Sciences*, 9 (2): 341-153.
- [2] Al-Tahir, F.M. and M.H. Abdul-Kadhem. 2018. Response of newly introduced wheat (*Triticum aestivum* L.) varieties to different planting dates. *Al-Muthanna Journal of Agricultural Sciences*, Volume (6), Issue (1).
- [3] Sajit, I.S.A. (2022). The effect of adding traditional and nano nitrogen fertilizer on the growth and yield of soft wheat varieties. Master's thesis, College of Agriculture - Al-Muthanna University.
- [4] Al-Ansari, A.S., W. Abdul-Ridha and S. Abdul-Karim (2014). Accumulation and distribution of dry matter during the growth stages of wheat varieties *Triticum aestivum* L. grown under the influence of different levels of nitrogen. *Al-Muthanna Journal of Agricultural Sciences*, Issue (1), Volume (3).
- [5] Selim, E.M., Z.M. Elsirafy and A.A. Taha (2010). Effect of irrigation methods and N. application on the utilization of nitrogen by sugar beet grown under arid condition. *Australian J. Basic and Applied Sci.* 4(7): 2114-2124.
- [6] Economic Feasibility Methods: New Agricultural and Rural Enterprises", openprairie, Retrieved 6-4-2022. Edited.
- [7] Jadoua, K.A. (1995). Wheat: Facts and Guidelines. Ministry of Agriculture. General Authority for Agricultural Guidance and Cooperation.
- [8] Zadoks, J.C., T.T. Chang and C.F. Knazak (1974). A decimal code for the growth stages of cereals. *Weed Res.*14:415-421.
- [9] Al-Shammari, A.M.H. (2023). The effect of foliar feeding stages with nano-microelements on growth characteristics, yield and economic feasibility of wheat varieties. Master's thesis. College of Agriculture - Al-Muthanna University.
- [10] Al-Burki, R.H.A. (2020). The effect of adding coated urea and fertilizer quantities on the growth, yield and quality of wheat. *Triticum aestivum* L. PhD thesis. College of Agriculture - Al-Muthanna University.