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**RESPONSE OF BARLEY (*Hordeum vulgare* L.) TO COATED-UREA
 CARRIERS UNDER RAS SUDR CONDITION
 BY**

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ABSTRACT

Two field experiments were conducted during the two winter seasons of 2000/2001 and 2001/2002 at Wadi Sudr Experimental Station. The aim of this study was to compare the effect of different carriers of slow release nitrogen fertilizer i.e Urea (46.5%), formaldehyde-coated urea (40%N), rock phosphate-coated urea (37%N), bentonite-coated urea (37%N), talic-powder coated urea (37%N) at the four following rates 0.0, 30, 50, 70 kg N/fed on some growth traits and forage yield of barley.

The results obtained indicate that the use of bentonite and talic powder showed superiority over the other treatments in respect to plant height, number of tillers and leaves /plant, leaf area, leaf/stem ratio. Moreover, bentonite, talic powder and rock phosphate treatment gave the highest forage yield, that increase amounted 32, 30, 26% for accumulated dry forage yield. On the contrary, urea formaldehyde depressed the accumulated dry forage yield by 25% of the normal urea. Raising nitrogen rates up to 70 kg N/fed significantly increased growth and yield of barley and the increases in the accumulated fresh and dry forage yield amounted 199, 211% of the unfertilized treatment respectively. The interaction effect between treatments was significant in fresh and dry accumulated yield and the highest were recorded with bentonite with 50 kg N/fed and talic powder with 70 kg N/fed.

Key word: Barley, slow release carriers, fertilizer levels, growth traits, forage yield.

INTRODUCTION

Losses of nitrogen from applied nitrogen fertilizers is one of the major reasons for poor N efficiency under different environmental conditions. Slow release nitrogen (N) carriers are often used to reduce N leaching losses from sandy soils. Preplant sulfur-coated urea gave greater yield than with preplant urea, and equal to yield from split applications of urea when added to onion Brown *et al.* (1998). Moreover, Zhou and Zhou, (1995); Guertal (2000) found that sulfur-

coated urea and polyolefin resin urea gave the maximum yield of bell pepper compared to yield from ammonium nitrate.

The efficiency of soil N fertilizer is influenced by various factors such as N source, N rate, N application time, plant species and other conditions specific to the site. Losses of ammonia through volatilization are affected by a number of factors like soil type, environmental conditions and fertilization management. The effect of N source and rate on the leachability and atmospheric loss of N fertilizer has received considerable attention. Many researchers have demonstrated that using slow-release N sources as sulphur coated urea (SCU) has increased the efficiency of N fertilizers by controlling the release or minimizing the loss of nutrients (Mays and Terman, 1969 on forage fescue; Allen *et al.*, 1978 on fescue grass and rye grass; Synder *et al.*, 1984 on bermuda grass; Modaihsh (1992) on forage oat). The use of slow-release N fertilizers reduce N leaching from cropland and extend N availability over the growing season (Wang and Alva, 1996). In order to decrease N leaching in field crops, farmers use split N applications, utilize slow-release fertilizers and incorporate soil treatments such as organic manure. Recently, slow-release nitrogen fertilizer has been suggested as a potential N fertilizer for sandy soil that can control N leaching and increase N use efficiency (Perrin *et al.*, 1997). On the other hand, Ayyer (1992) reported that N losses from the soil could be controlled by coating soluble fertilizers with insoluble materials, thereby reducing its solubility and release into the soil. Urea formaldehyde gave the highest plant height, number of tillers/plant and biological yield of wheat (Zeidan and El-Kramany., 2001); Kolhe and Mitra, (1989); Ragasits and Berecz, (1996) and Zhang *et al.* (1998) showed that slow-release urea increased wheat yield by 18.3-27.8% and increased rice yield by 27.5-50.4% as compared with common urea. Perrin *et al.* (1997) showed that amending sandy soils with slow-release N can reduce N leaching and increase sweet corn plant growth compared with that grown in soil amended with ammonium sulfate.

Advances in fertilizer technology have produced a new type of slow-release fertilizers in which nutrients release may be controlled by water solubility of the material, microbial decomposition, or diffusion through an impermeable coating Hauck, (1985). Gandeza and Shoji, (1992) showed that the release of nutrients from resin-coated materials is controlled by the moisture permeability of the resin coating and soil temperature. Leaching losses of a polymer-coated ammonium nitrate were less than that from ammonium nitrate (Alva, 1992). In a greenhouse study N leaching from a resin-coated urea was less than that from comparable N rates of ammonium nitrate (Wang and Alva, 1996). Moreover, N uptake and recovery of applied urea were significantly greater with coated urea materials than with prilled urea. Dou and Alva (1998) showed that various N losses were lower from the controlled release fertilizers source than from soluble fertilizers. Aziz and El-Ashry (2002) found the most effective treatment was urea coated with rock phosphate.

Among coated-urea materials at 80 kgN/ha as neem cake-coated urea and sulphur coated urea were significantly superior to the prilled urea at 120 kg N/ha respected to the yield, yield attributes and N uptake in rice-wheat system

Chauhan, (1999) and El-Aila (1998) on sudan grass. Dry matter yield of barley was higher with coated urea than with urea at each of the following rate of N application 100, 200, 300 kg N/ha. The potential N loss was less with coated urea than urea (Zhang *et al.*, 2000). The effect of oxamide or polyolefin resin-coated urea ensure the N benefit on plants (Miah *et al.*, 2000), sulphur coated urea (Elwan *et al.*, 2000); formaldehyde coated urea (Sonbol *et al.*, 2000).

The present investigation was undertaken to evaluate the beneficial effect of coating soluble N fertilizer (urea) with insoluble material (formaldehyde, rock phosphate, bentonite, talic powder) on growth and forage yield of barley grown in newly reclaimed soil.

MATERIALS AND METHODS

Two field experiments were carried out at Wadi Sudr Experimental Station, Desert Research Center, South Sinia Governorate, during winter seasons of 2000/2001 and 2001/2002 in order to study the efficiency of coated-urea fertilizers on growth and yield of barley (*Hordeum vulgare* L.) variety Giza 123 in newly reclaimed sandy soil. The soil was clay loam in texture, pH 7.6, CaCO₃ 49.6% and irrigated with underground water 3400 ppm salinity. Barley grains were sown at a rate of 50 kg/fed on 23 and 26 October in 2000 and 2001, respectively. The experiment was laid out in a split plot design with four replications. The main plot were devoted for nitrogen fertilization rates (0.0, 30, 50 and 70 kg N/fed) while nitrogen carriers, Urea (46.5%), formaldehyde-coated urea (40%N), rock phosphate-coated urea (37%N), bentonite-coated urea (37%N), talic powder-coated urea (37%N) were allocated in the subplots. The subplot area was 10.5m² (3x3.5m) and consisted of five rows 60 cm apart. Nitrogen fertilizer as common urea was splitted into two equal doses the 1st dose was applied after one month from sowing with irrigation, while the 2nd dose was applied after the first cut directly followed by irrigation. Slow release N fertilization treatments (urea formaldehyde, rock phosphate, bentonite, talic powder) were applied at one 30 days from sowing for all rates.

Phosphorus fertilizer as calcium superphosphate (15.5%P₂O₅) was added at a rate of 150 kg/fed as a basal application during soil preparation. The recommended field practices for barley production were followed during the two growing seasons. Two cuts were taken every season, the first cut was harvested after 75 days from sowing and the second one was obtained 45 days later. Samples of selected guarded plants were taken at random from each experimental unit before cutting to determine the following growth traits including plant height (cm), number of tillers/plant, number of leaves/plant, leaf area (cm²), leaf/stem and chlorophyll content (SPAD) were determined in the field by the Minolta SPAD chlorophyll -Meter (Model SPAD 502) yhis reading is in SPAD unit, which are values by Minolta to indicate the relative amount of chlorophyll contained in plant intact leaves, were determined according to (Yadava, 1986). All plants of each plot were clipped to determine fresh and dry forage yields of leaves, stems and whole plant in ton/fed.

The obtained data were subjected to the proper statistical analysis of variance of split plot design according to Steel and Torrie (1980). As the homogeneity test for the results of the two growing seasons was insignificant, the combined analysis of the two seasons was applied. Comparison among treatment means were made according to multiple range and multiple F-Test (Duncan, 1955).

RESULTS AND DISCUSSION

The response of barley plants to the two investigated factors i.e. nitrogen carriers and nitrogen rates will be discussed separately.

1-Effect of nitrogen carriers:

A-On growth traits:

a-plant height (cm) :

Results in Table (1) indicate that barley plant height was increased to different extents by the used N carriers. These increases in plant height were more pronounced and reached the significant level. The tallest barley plants were achieved with both talic powder and bentonite carriers as compared with other treatments. Meanwhile all N-carriers used increased barley plant height if compared with urea fertilizer. Using talic powder as urea carrier increased barley plant height if compared with urea treatment by 11.75 % and 28.09% in the 1st and 2nd cut, respectively. This finding demonstrate clearly the influence of talic powder on the slow release of urea. This finding is in agreement with Aziz and El-Ashry (2002) who found that plant height of *Cymbopogon citratus* was increased when fertilized with rock phosphate coated urea compared with common urea fertilizer.

b-Number of tillers/plant:

The number of tillers/plant was not significantly affected by the used N carriers in both cuts. Meanwhile, the 2nd cut showed that both bentonite and talic powder carriers showed superiority in this trait over the other treatments. Similar results were obtained with Zeidan and Kramany (2001). In contrary Aziz and El-Ashry (2002) found that rock phosphate increased the number of tillers of *Cymbopogon citratus* than that treated with bentonite and sulpher coated urea.

c-Number of leaves/plant:

The number of leaves/plant was significantly affected by the N-carriers used in this investigation. The influence of the N-carriers on this trait was more clear in the 2nd cut in which both talic powder and bentonite showed significant increases in number of leaves/plant if compared with other treatments. This response may be attributed to the wide variations in leaching losses of N-urea in sandy soils that vary from 30% to 70% depending on the type of applied fertilizers (Seng, 1986). Coating urea fertilizer with various coating materials, reduce its solubility and release into the soil and consequently a higher availability of N was maintained to the plant. In this respect, Muni-Ram *et al.* (1989) on *Japanese mint* and Singh and Singh (1992) on *Cymbopogon winterianus* Jowett reached similar findings.

d-Leaf area (cm²) :

Results in Table (1) revealed that the leaf area was significantly increased to different extents by using the slow release urea fertilizers (N-carrier) if compared with the normal urea fertilizer. This finding was true for the two taken cuts .Significant increases in leaf area were obtained with the use of rock phosphate, bentonite and talic powder as N-carriers. The increases in leaf area due to the use of bentonite as a urea carrier amounted 26% of the control (uncoated urea) in the 1st cut and 8% in the 2nd cut .This could be attributed to the availability of nitrogen throughout the growing season with the slow release fertilizers.

e-Chlorophyll content:

Chlorophyll content was significantly affected by the N-carriers, this finding was true for the two taken cuts. Significant increase in chlorophyll content were obtained with the use of bentonite and talic powder .

f-Leaf /stem ratio:

The obtained results showed that this trait was significantly affected by the used urea carriers .The highest leaf/stem ratio was obtained with the use of bentonite in both cuts. This last finding was quite expected due to its significant increases in both the number of leaves per plant as well as the leaf area. This may be due to the carrier role in increasing and encouraging the photosynthesis process in the leaf, so the highest values were obtained with talic powder, bentonite and rock phosphate. The superiority of the previous three N carriers may be due to its slow release was more than other carriers so protect the nitrogen from leaching so the plant absorb it and be reflected on the growth. Moreover, these three carriers are natural soil products so it resembles to the behavior of soil while formaldehyde is a chemical product and has different behavior of soil and reflected negatively on the values of growth traits. On the other hand, urea give the lowest value as compared with other forms of nitrogen. These findings illustrate that slow release carriers protect nitrogen from leaching while urea leached with irrigation and volatilization. Such results were in agreement with Nyborg *et al.* (1999) they revealed that thick-coated urea had great yield of barley compared to noncoated urea.

B-On fresh and dry forage yields:

a-Fresh forage yield:

Results in Table (2) demonstrate the effect of various urea carriers on leaves, stems, total (leaves + stems) and accumulated fresh forage yields.

The effect of the studied urea carriers on the fresh forage yield of leaves, stems and total was in the same trend for both cuts .

The use of rock phosphate, bentonite and talic powder as urea carriers showed significant increases in fresh forage yields when compared with that of the normal urea fertilizer. These increases in fresh forage yields due to the above urea carriers could be attributed to its nature and its behavior in soil. On the other hand, the use of formaldehyde as urea carrier showed deteriorated effects on the

fresh forage yields if compared with the use of normal urea fertilizer. The decrease in forage yield due to formaldehyde could be due to the behavior of its chemical nature in soil. The depression in total forage yield due to the use of formaldehyde amounted to 19, 27% in the 1st and 2nd cut of the normal urea, respectively. These results agree with Modaihsh, (1992) who found that yield of oat was increased with split urea addition and superior to the sulfur coated urea and urea formaldehyde.

The highest fresh forage yields were obtained with the use of bentonite and talic powder as urea carriers followed by that of rock phosphate. This finding hold fairly true for the two cuts and no significant differences were obtained between bentonite and talic powder treatments. This could be attributed to that bentonite is natural deposits of clay soil that overcome the physical disadvantages and maintain favorable physical properties of new reclaimed sandy soils. Slow-release characteristic of bentonite and talic powder that makes N available to plants over a more extended period of time.

The average increases in the accumulated forage yield due to the use of either talic powder or bentonite amounted about 45, 41% of the normal urea fertilizer, respectively. These increases could be attributed to the long availability of nitrogen due to its slow release from these slow release carriers. On the contrary, the use of formaldehyde as urea carriers depressed the accumulated fresh forage yield by 22% of the normal urea. Similar results were reported by Nyborg *et al.* (1999) who found that thick-coated urea had greater yield of barley compared to noncoated urea, Kolhe and Mitra (1989), who found that slow-release nitrogen fertilizer gave the highest yield of wheat. Ragasits and Berecz (1996) and Zhang *et al.* (1998) also showed that slow-release urea increased wheat yield by 18.2-27.8% and increased rice yield by 27.5-50.4% as compared with common urea. Perrin *et al.* (1997) showed that amending sandy soils with slow-release N can reduce N leaching, increase plant growth and yield of sweet corn compared with that grown in soil amended with ammonium sulphate. El-Saidy (2003a) obtained higher forage yield of teosinte with urea formaldehyde if compared with organic manure.

b-Dry forage yield:

The response of dry forage yields of leaves, stems, total (leaves + stems) and accumulated (1st +2nd cuts) to the use of N-fertilizer carriers showed similar trend to those of fresh forage yields (Table 2) .

The use of rock phosphate, bentonite and talic powder as natural N-carriers improved to different extents the leaves and stems dry forage yields in the two taken cuts. These improvements reached the significant level in the 2nd cut if compared with the use of normal urea fertilizer.

In respect to the effect of the above three carriers on the accumulated dry forage yields, results revealed the following:

1- The highest dry forage yields were obtained with bentonite followed by talic powder and then by rock phosphate in both seasons.

Table (1): Effect of nitrogen carriers on some growth traits of barley (Combined analysis of the two growing seasons) .

	Plant height (cm)		No of tillers/plant		No of leaves/plant		Leaf area (cm ²)		Chlorophyll content (SPAD)		Leaf/Stem ratio	
	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
Urea	61.00d	36.17c	3.14a	5.35a	12.72a	15.52b	23.26b	14.04b	40.46ab	30.96b	0.881b	0.952c
Formaldehyde	63.26cd	34.66d	3.09a	5.21a	12.30b	15.54b	23.42b	14.22b	35.57b	32.26a	0.952a	0.954c
Rock phosphate	64.94bc	36.07c	3.15a	5.17a	12.40ab	15.57b	27.93a	14.63b	34.76b	31.23ab	0.919b	1.029b
Bentonite	66.22ab	42.16b	3.12a	5.84a	12.24b	18.36a	29.32a	17.04a	41.48a	31.54ab	0.977a	1.041a
Talic powder	68.17a	46.33a	3.14a	5.81a	12.43ab	18.66a	28.59a	17.63a	39.73ab	32.40a	0.900b	0.942c

Table (2) :Effect of N-carriers on fresh and dry forage yields of barley (Combined analysis of the two growing seasons).

N-carriers	Leaves yield (Ton/fed)		Stem yield (Ton/fed)		Total yield (Ton/fed)		Accumulated forage yield
	1 st	2 nd	1 st	2 nd	1 st	2 nd	
Fresh forage yields							
Urea	3.474bc	1.953b	4.095bc	2.541c	7.569bc	4.494c	12.063b
Formaldehyde	2.815c	1.591c	3.545c	1.933d	6.360c	3.524c	9.884b
Rock phosphate	4.662ab	2.782a	5.489ab	3.078b	10.151ab	5.860b	16.011a
Bentonite	4.939a	2.999a	5.751a	3.382ab	10.690a	6.381ab	17.071a
Talic powder	4.868a	3.133a	5.839a	3.659a	10.707a	6.792a	17.499a
Dry forage yields							
Urea	1.755ab	1.114b	2.092ab	1.312b	3.847ab	2.426b	6.273b
Formaldehyde	1.563b	0.861c	1.662b	0.927c	3.225b	1.788c	5.013b
Rock phosphate	2.243ab	1.579a	2.542a	1.548ab	4.785a	3.127a	7.912a
Bentonite	2.555a	1.584a	2.640a	1.524ab	5.195a	3.108a	8.303a
Talic powder	2.322ab	1.523a	2.653a	1.687a	4.975a	3.210a	8.185a

- 2- The increases in the accumulated dry forage yields amounted 32, 30 and 26 % of the normal urea for the previous three N-carriers, respectively.
- 3- On the contrary, the use of formaldehyde as N-carrier depressed significantly the accumulated dry forage yield and its components if compared with other treatments. This depression in the accumulated dry forage yield due to the use of formaldehyde as N-carrier amounted 25% of the normal urea fertilizer .This may be due to that the chemical nature of formaldehyde is not easily absorb by roots than urea or perhaps that the degree of release of nitrogen could be easy for one form of carriers and difficult for another.

Rock phosphate, bentonite and talic powder are natural conditioners and improve the physical and chemical properties of the soil. In this respect Zhou and Zhou (1995) revealed that, slow release fertilizers provide plant with nutrients, stimulate plant growth, promote nitrogen fixation, increase fertilizer efficiency, improve crop quality and yield. Moreover, N uptake and recovery of applied urea were significantly greater with coated urea materials than with prilled urea.

2-Effect of nitrogen rates:

A-On growth traits:

Results in Table (3) demonstrate the positive and significant effects of nitrogen rates on the studied barley growth traits. This positive effect was more pronounced in the second cut.

a-Plant height:

Increasing N rates increased barley plant height in both cuts .Differences among the applied N rates were more pronounced in the 2nd cut .Similar findings were reported by Ahmed *et al.* (1993) on barley; El-Aila (1998) on sudan grass; Zhang *et al.* (2000) and Ahmed *et al.* (2002) on barley found that increasing the rate of nitrogen from 70 to 105 N/ha increased plant height of barley. The increase in plant height due to the increase of N rates could be due to that N element has an important role in building-up the protoplasm and enhances the meristematic activity due to its role in protein synthesis.

b-Number of tillers/plant:

The number of tillers/plant was greatly influenced by the applied N rates particularly in the 2nd cut . The increases in number of tillers / plant were 36, 51, 56% as compared with unfertilized treatment under the rates of 30, 50 and 70 kgN/fed, respectively .These increases in number of tillers/plant might be attributed to the N role in building-up plant organs through the synthesis of amino acids and building-up new organs.

c-Number of leaves/plant:

Increasing the nitrogen rates affected positively and significantly the number of leaves /plant. This finding hold fairly true for both cuts .The highest number of leaves /plant was recorded with 50 kg N/fed in the 1st cut and with 70 kg N/fed in the 2nd cut .Differences between the highest two rates (50 and 70 kg N/fed) were not great enough to reach the significant level. The increase in number of leaves/plant was quite expected since plant height was significantly increased with the increase in nitrogen rate.

d-Leaf area (cm²) :

Nitrogen rates affected the leaf area to different extents. The increases in leaf area due to the applied N rates reached the significant level in the 2nd cut and differences between the highest two rates were not significant. Similar result was agree with Megahed (2003) who found that under saline condition the highest value of growth parameters of barley plants were obtained by the lowest dose (30kgN/fed) .

e-Chlorophyll content:

The applied N rates increased the Chlorophyll values when compared with the control treatment. the chlorophyll values in the 1st cut was higher and more pronounced than that of the 2nd cut. No differences were observed in the chlorophyll values among the applied N rates in the 1st cut but this was not the case in the 2nd cut. This result agreed with El-Saidy, (2003b) who found no significant difference between 30 and 50kg N/fed on chlorophyll of barley. The increase in the chlorophyll values due to the increase of applied nitrogen in mainly due to that N is a main component in chlorophyll molecule.

f-Leaf/stem ratio:

Nitrogen rates non significant affected on the behave of leaf/stem ratio and the trend was no clear in the first cut while in the second cut 70 Kg N/fed increased l/s.

B-On fresh and dry forage yields:

Results in Table (4) demonstrate the significant positive increases in the accumulated fresh and dry forage yields as well as on its components i.e leaves and stems.

Increasing nitrogen rates up to 70kgN/fed increased the forage yield of leaves, stems and whole plant. These increments were significant in both cuts and in all values of dry forage yields. In the first cut there were no significant differences between 70 kg N/fed and 50 kgN/fed in fresh and dry yields. While in the second cut 70 kg N/fed was significantly superior in forage yield. These results agreed with those of Ahmed *et al.* (1993) and Ahmed *et al.* (2002)

The increases in the accumulated fresh forage yield amounted 140, 177, 199% of the control (unfertilized treatment) under the used rates of 30, 50 and 70 kg N/fed, respectively.

Similar increases in the accumulated dry forage yields were obtained 164, 179, 211% by increasing the applied rate of N fertilizer.

3-Effect of N-rates x N-carriers (forms) interaction on:

Both fresh and dry forage yields of leaves, stems, total (leaves + stems) and accumulated yields were significantly affected by the interaction effect between N carriers and rates. This means that the yield responses to N forms (carriers) does not behave the same under the different rates of nitrogen.

Table (3) : Effect of nitrogen rates on some growth traits of barley (Combined analysis of the two growing seasons).

N- rates	Plant height (cm)		No of tillers/plant		No of leaves/plant		Leaf area (cm ²)		Chlorophyll content (SPAD)		Leaf/Stem (on dry basis)	
	1 st cut	2 nd cut	1 st cut	2 nd cut	1 st cut	2 nd cut	1 st cut	2 nd cut	1 st cut	2 nd cut	1 st cut	2 nd cut
0.0	45.67c	28.97c	2.60b	4.03c	11.51b	12.27c	19.83b	12.11c	32.53b	28.96c	0.984a	1.038ab
30	68.09b	41.06b	3.30a	5.49b	12.51a	16.86b	26.92a	15.78b	38.81a	31.76b	0.919a	0.874b
50	69.96b	44.72a	3.24a	6.09a	12.89a	18.69ab	29.73a	16.73ab	40.70a	32.65ab	0.903a	1.062a
70	75.16a	43.54a	3.37a	6.29a	12.77a	19.11a	29.53a	17.41a	41.56a	33.32a	0.897a	0.960ab

Table (4) :Effect of N-rates on fresh and dry forage yields of barley (Combined analysis of the two growing seasons).

N- rates	Leaves yield (Ton/fed)		Stem yield (Ton/fed)		Total yield (Ton/fed)		Accumulated forage yield
	1 st	2 nd	1 st	2 nd	1 st	2 nd	
Fresh forage yields							
0.0	1.790c	0.917c	2.594c	1.025d	4.384c	1.942d	6.326d
0.30	4.258b	2.616b	5.151b	3.172c	9.409b	5.788c	15.197c
50.0	5.211a	3.088a	5.727ab	3.507b	10.938a	6.595b	17.533b
70.0	5.348a	3.343a	6.304a	3.972a	11.652a	7.315a	18.967a
Dry forage yields							
0.0	0.994c	0.502c	1.009b	0.485c	2.003c	0.987c	2.990c
0.30	2.272b	1.430b	2.530a	1.674ab	4.802b	3.104b	7.906b
50.0	2.431ab	1.624ab	2.747a	1.548b	5.178ab	3.172b	8.350b
70.0	2.655a	1.774a	2.986a	1.893a	5.641a	3.667a	9.308a

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Results in Table (5) demonstrated that clearly in which the highest fresh and dry accumulated yields were recorded with bentonite at 50 kg N/fed, while talic powder gave the highest yield with the nitrogen rate of 70 Kg N/fed.

In conclusion, amending sandy soil with slow release nitrogen fertilizers reduce N leaching and increase the yield of barley in such a poor soil. Also the effect of slow release N is positive from both environmental and economical aspects. The use of slow-release N fertilizers, when applied in optimal rates at the right time, minimize the risk of N losses by leaching and enhanced N uptake, as well as positive effects on both plant growth and soil nutrient levels.

Table (5): Effect of the interaction between nitrogen carriers and rates on fresh and dry accumulated forage yields Combined analysis of the two growing seasons).

Nitrogen carriers	Nitrogen rates (kgN/fed)			
	0.0	30	50	70
Accumulated fresh yield (ton/fed)				
Urea	6.327h	14.358e	8.347g	19.221c
Formaldehyde	6.327h	8.356g	12.341f	12.513f
Rock phosphate	6.327h	16.997d	21.754b	18.965c
Bentonite	6.327h	16.864d	24.503a	20.596bc
Talic powder	6.327h	19.413c	20.723bc	23.535a
Accumulated dry yield (ton/fed)				
Urea	2.989g	7.765de	4.732f	9.612b
Formaldehyde	2.989g	4.804f	4.996f	7.262e
Rock phosphate	2.989g	8.445cd	10.710a	9.508b
Bentonite	2.989g	9.563b	11.665a	9.000bc
Talic powder	2.989g	8.955bc	9.648b	11.152a

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استجابة الشعير لحوامل اليوريا تحت ظروف منطقة راس سدر

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أقيمت تجربتان حقليتان خلال الموسم الشتوى ٢٠٠٠/٢٠٠١، ٢٠٠١/٢٠٠٢ فى محطة بحوث راس سدر التابعة لمركز بحوث الصحراء وكان الهدف من هذه الدراسة المقارنة بين حوامل مختلفة لتيسر السماد الازوتى (اسمدة بطينة التحلل) مثل يوريا فورمالدهيد، يوريا صخر الفوسفات، يوريا بنتونيت، يوريا بودرة تلك، يوريا عادية مع مستويات مختلفة من التسميد الازوتى صفر، ٧٠، ١٠٠، ١٥٠ كجم نيتروجين/فدان على بعض صفات النمو والحاصل العلفى الغض والجاف للشعير. أوضحت النتائج ان يوريا بنتونيت، بودرة تلك تفوقت على معظم المعاملات الاخرى واعطت اعلى زيادة فى طول النبات، عدد الافرع، عدد الاوراق، مساحة الورقة، نسبة الاوراق/السيقان. بالاضافة الى هذه النتائج كان اعلى حاصل علفى غض او جاف متحصل عليه عند استخدام يوريا بنتونيت، يوريا بودرة تلك، يوريا صخر الفوسفات. كان مقدار الزيادة فى المحصول الجاف حوالى ٣٢، ٢٦، ٣٠ % عند استخدام الاسمدة السابقة مقارنة باليوريا العادية بينما حدث نقص عند استخدام اليوريا فورمالدهيد بمقدار ٢٥% عن اليوريا العادية. اما بالنسبة لمعدلات التسميد الازوتى فزيادة المعدلات الى ٧٠ كجم نيتروجين/فدان زود معنويا كل من النمو، الحاصل العلفى للشعير، هذه الزيادة كانت مقدارها ١٩٩، ٢١١% للغض والجاف على الترتيب مقارنة بالمعاملة الغير مسمدة. التفاعل بين المعاملات كان معنوى فى الحاصل العلفى المتجمع غض وجاف فى حالة البنتونيت مع المعدل ٥٠ كجم نيتروجين/فدان وبودرة تلك مع المعدل ٧٠ كجم نيتروجين/فدان.