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EFFECT OF RICE STRAW FORM APPLICATION WITH AND WITHOUT N, P AND K AND/OR BIOFERTILIZERS ON WHEAT CROP IN CLAY SOIL

El-Naggar, E. M. [1] and A. M. El-Ghamry[2]
1- Egyptian Fertilizer Development Center, El-Mansoura, Egypt.
2- Soils Department, Faculty of Agriculture, Mansoura University, Egypt

ABSTRACT

A field experiment was conducted on a clayey soil at Monshaat Abdel-Rahman Village, Dekerns District, Dakahlia Governorate during winter season of 2002/2003 to study the effect of application of rice straw as "fresh straw, ash straw and composting straw" with and without N, P and K chemical fertilizers and/or biofertilizers (Nitrobien) on the biological yield (grain and straw), NPK concentration and uptake of wheat plants. The experiment was factorial with arranged in a complete randomized block design with 4 replicates and 16 treatments.

The three studied treatments of (fresh, ash and compost straw), chemical fertilizer (N, P and K) and biofertilizer (nitrobien consists of Azospirillum) as well as the interactions among them exhibited a significant positive effect. Where results show that yield of wheat was significantly effect by the applied bio and chemical fertilizers. If was found that composting rice straw increased grain and straw yield of wheat. Macronutrient content (N, P and k) In both grain and straw at harvest stage. More increases were found with bio-fertilizer applications.

The study under the present conditions recommends that use of composting rice straw with bio and chemical fertilizer. The lowest of production was obtained by using the ash of rice straw as well as with or without bio-fertilizer and chemical fertilizer. Such treatment can decrease the environmental pollution resulting from burning the rice straw in fields and prevent the black cloud.

Keyword: rice straw, ash, compost, biofertilizer, wheat.

INTRODUCTION

Rice is one of the most important exportation and food crops in Egypt. The annual rice area in Egypt more one million feddans which produce 2.4 million tons rice (the average is 2.4 ton/feddan) in the period from 1984 to 1987.

In the last few years rice production progressed where planting area became 1.5 - 2.0 million feddans and the average of productivity became 4.09 tones/feddan (Technicality recommendation for rice 2004). The rice straw residue is about 6.5 million tons/year. The large quantity of it is disposal by burning the straw in the field and this way for removal straw caused air pollution and this is attached to human health and soil microflora because of rising soil temperature. The small quantity of it is used for animal feeding or as a fuel.

The average of rice straw in season 2003 for the Egyptian governorates as follows: Kafr-ElShikh (4.33), Dakahlia (4.13), El-Behira (4.17), El-Sharkia (3.89), El-Gharbia (4.28), Demiatta (3.83), and El-Fayom (3.88 ton/feddan).

So, it should be used a scientific method in these governorates to disposal the rice straw in beneficial way and also to avoid the air as following:

- Use it as a forage.

- Encourage composting manufacture from rice straw and training the farmers to do it.
- Transfer it to new reclaimed sandy soil where it used as organic fertilizers and also for warming the plants in winter season and moreover using it also to reduce the soil erosion.
- It can also use it to industrialize the paper.

Since few years the problem was less because the farmers in the Egyptian village used it as a fuel but now they didn't use it.

This is the actual reasons for the problem and now the air pollution increased as a result of burning rice straw in the field and black cloud was appeared and that pollution is dangerous and harmful for human health which caused a lot of diseases. So this problem should be faced.

N, P and K fertilizer application is the major factor that affect plants production and grain quality (Kandeel *et al.*, 1992, Ceylan *et al.*, 1994 and Biswas *et al.*, 1995).

Organic matter is involved in plant production in many countries due to its effects on physical, chemical and biochemical characteristics of soil and plant (El-Ghadban 1998 and Osamn, 2000).

El-Leithi *et al.*, (1996), Gomaa, (1997), El-Barary, (1998) and Hamed, (1998), studied the effects of different levels of chemical fertilizers for N on wheat production and protein content as well as mineral composition. They found that increasing nitrogen levels up to 90, 100 kg N/fed increased the yield, protein content and mineral composition of wheat plants.

The aim of this work is to study the effect of using fresh, ash and compost of rice straw and also chemical and bio- fertilizers on wheat yield, chemical composition and some nutrients uptake. Anther aim for this study is solving the bad habits of burning the rice straw in the fields which reflects on people health.

MATERIALS AND METHODS

A field experiment was conducted at Manshaat Abd-Elrahman village, Dekernes district, Dakahlia Governorate during winter season 2002/2003 to study the effect of rice straw forms "fresh, straw, ash and compost" with and without NPK and/or bio-fertilizer on wheat yield grown in a clayey soil.

The experiment consists of 16 treatments representing the combinations between the organic, mineral and biofertilizers as shown in the following:

1- Control	9- Biofertilizer (Bio)
2- Fresh Straw	10- Straw + Bio
3- Ash	11- Ash + Bio
4- Compost	12- Compost + Bio
5- NPK	13- NPK + Bio
6- Fresh Straw + NPK	14- Fresh Straw + NPK + Bio
7- Ash + NPK	15- Ash + NPK + Bio
8- Compost + NPK	16- Compost + NPK + Bio

The experiment design was factorial which arranged in a complete randomized block design with 4 replicates.

The experimented plot area was 4x5m^2. The field was ploughed, leveled and plots of 20m^2 were build up. Un-inoculated and inoculated with Nitrobien wheat grains of Sakha 69 variety at the rate of 70 kg/fed were sown and irrigated immediately.

Straw forms "fresh, ash and compost" were added to the soil at rate 25 kg/plot (20 m^2) and incorporated in soil plots at depth 20 cm and ploughed it, the fresh straw was cutting after added to soil, while ash treatment applying to the soil after weigh 25 kg fresh straw and burning in each plot, the chemical fertilizer (75 kg N / fed) was applied in two equal doses as ammonium nitrate (33.5% N) the 1st dose was applied after 25 days from sowing, while the 2nd dose was applied after one month from the 1st application, P_2O_5 as super phosphate (15 kg/fed) in one dose was applied after 25 days from sowing and K as potassium sulfate (48% K_2O) was added after 45 days from sowing.

Soil, straw, ash and compost analyses (Tables 1-3) were carried out according to Jakson (1967).

Table (1): Straw and ash analysis.

	N	P	K	Fe	Zn	Mn	Cu	Pb	Ni	Cd	Total C%	C:N ratio
	mg Kg^{-1}											
Straw	4100	700	3200	243	38	185	12	63	18	3.4	12.1	34:1
Ash	58	13	48	5.4	3.2	4.0	1.1	48	15.3	2.8		

Table (2): Compost analysis.

Parameter	Value	Parameter		Value	Parameter		Value
Total C (%)	23.1	Total (mg Kg^{-1})	Fe	19610	Available (mg Kg^{-1})	Fe	180
Total N (%)	1.55		Mn	338		Mn	101.6
C:N ratio	17.1		Zn	75		Zn	11.36
Total P (%)	0.13		Cu	37		Cu	4.10
Available P mg Kg^{-1}	300		Pb	460		Pb	4.4
Total K (%)	0.65		Ni	80		Ni	1.6
Available K mg Kg^{-1}	1580		Cd	8.5		Cd	1.8
pH (1:5)	5.96	S.P. (%)		260			

Sp = saturation percentage

Table (3): Mechanical and chemical analysis of the soil.

Parameter		Value	Parameter		Value
Mechanical analysis	C. Sand (%)	2.0	EC (dSm^{-1})		2.6
	F. Sand (%)	9.3	CEC (c mol Kg^{-1})		52.5
	Silt (%)	38.4	Available (mg Kg^{-1})	N	53
	Clay (%)	50.3		P	7.8
	Texture	Clayey		K	814
$CaCO_3$ (%)		2.75		Fe	8.2
O.M. (%)		2.2		Mn	5.9
S.P. (%)		82.5		Zn	0.55
pH		8.0		Cu	0.34
			Total P (mg Kg^{-1})		580

Commercial name of biofertilizer in Egypt is Nitrobien which contained *Azospirillum* sp and *Azotobacter chrooccum*.

RESULTS AND DISCUSSION

Effect of rice straw, NPK, chemical and bio- fertilizers on the biological yield of wheat can be shown as follows:

1- Grain yield:

Data in Table (4) showed that the effect of application of rice straw (fresh, ash, and compost), chemical (N, P and K) fertizers and biofertilizers (nitrobien) on grain yield of wheat plants. Data revealed that application of compost and straw without or with biofertilzer treatment gave high significant yield of grain compared with control for all treatments. However the comparison of compost with biofertilizer gave the highest grain yield compared with other treatments of experiment, while ash treatments gave the lowest yield (grain) compared with other treatments.

Inoculation of seeds with biofertilizers (Nitrobien) treatment gave the highest grain yield of wheat compared with all treatments, i.e, rice straw as fresh, ash and compost recoded 7.08, 6.80, 7.59 kg/20 m^2 without NPK and biofertilizer, 14.73, 14.25, 15.83 kg/20 m^2 with NPK and without biofertilizer, 7.21, 6.98, 8.00 kg/20 m^2 without NPK with biofertilizer, 16.48, 15.08, 17.00 kg/20 m^2 with NPK and with biofertilizer, respectively.

Table (4): Effect of applied rice straw, chemical and biofertilizer on grain and straw yield of wheat plants.

Treatment		Without biofertilizer		With biofertilizer	
		Grain kg/20 m^2	Straw kg/20 m^2	Grain kg/20 m^2	Straw kg/20 m^2
Without NPK	Control	6.73	19.09	7.05	18.67
	F. Straw	7.08	19.95	7.21	19.11
	Ash	6.80	19.17	6.98	19.23
	Compost	7.59	21.94	8.00	23.00
L.S.D. (0.01)		**0.16**	**0.26**	**0.08**	**0.52**
L.S.D. (0.05)		**0.11**	**0.18**	**0.05**	**0.36**
With NPK	Control	14.38	26.44	15.13	28.72
	F. Straw	14.73	26.32	16.48	28.58
	Ash	14.25	24.5	15.08	28.42
	Compost	15.83	29.65	17.00	31.53
L.S.D. (0.01)		**0.22**	**0.36**	**0.11**	**1.22**
L.S.D. (0.05)		**0.16**	**0.25**	**0.08**	**0.85**

The positive interaction effect between organic, soluble N, P and K and biofertilziers can be attributed for saving the bacteria of biofertilizer (Nitrobien) to fix nitrogen and avoid N losses of soluble chemical N fertilizer. This N helps in increasing plant growth and yield component of wheat plants. Kaloosh and Koreish (1995) concluded that biofertilizer and organic fertilizer increased wheat plant growth than mineral fertilizer. These findings may be attributed to the gradual release of available N sources due to the use of nitrobien and chichen manure than mineral fertilizer. Fixer bacteria as Azotobacter and Azospirillum can secrete hormones, which encourage plant growth and increase nutrients uptake (Saber, 1993). Zambra et al (1984)

found that the plant growth response for *Azospirillum brasilense* or to an increased nutrient uptake by inoculated roots as reported by many workers.

Data in Table (4) reveal that also burning rice straw (ash) gave the lowest grain yield compared with all treatments (straw and compost) with and without biofertilzer and chemical fertilizer. This can be attributed to the effect of complete burning of rice straw on decreasing availability of macro and micronutrients which resulted in losses of all nutrient and also increasing soil heat. These results are in agreement with those obtained by Sharma and Mishra (2001) who indicated to the effect of burning rice and wheat crop residues resulting in loss of N, P, K and S from soil and changes in the nutrient availability. Losses of N, P, K and S were measured and the influence of soil heating on the availability macro and micronutrients in the soil was studied, complete burning of the rice straw resulted in 100, 20.1, 19.8 and 80.2% loss of N, P, K and S respectively. Corresponding losses due to burning of wheat straw were 100, 22.2, 21.8 and 75.0%. There was no loss of micronutrients such as Fe, Mn, Zn and Cu due to incomplete burning of the rice and wheat straw. To studying the effect of soil heating on nutrient availability, it was found that the temperatures of 50, 100 and 150 °C for one, two and foure h were imposed. Heating up soil to 150 °C showed no significant effect on soil organic carbon content. Results also showed that temperature of heating was more important than duration of heating (Sharma and Hishra, 2001).

2- Straw yield

Data in Table (4) illustrated the effect of applied rice straw, chemical and biofertilizer on straw yield of wheat plants.

All treatments gave a high significantly yield compared with control (without application) however compost gave higher straw yield than other treatments. Organic + chemical N, P, K fertilizers and treatments compost + NPK gave the highest straw yield than the straw + NPK and ash + NPK was less than treatments of organic fertilizers only.

Results in Table (4) show the inoculation of seeds of wheat with biofertilizer (nitrobien) gave more straw yield than treatments without biofertilizer. It was noticed that the compost + NPK + Biofertilizer gave the highest straw yield among all treatments of experiment.

The treatments of rice straw + bio-fertilizers gave 18.67, 19.11, 19.23, 23.0 kg of straw yield of rice for control, straw, ash and compost treatment respectively, from $20m^2$, while treatment of organic + NPK + bio yielded 28.72, 28.58, 28.42, 31.53 Kg for control, straw, ash and compost treatment, respectively of wheat straw from the same area.

The results pointed out that application of rice straw + NPK fertilizer with biofertilizers achieved the highest yield of wheat straw. This was referred to stimulating the influence of nitrogen either from organic or mineral source on activation of N_2-fixers and its enhancing effect on the availability of N for plant growth. The obtained results are in conceder with the finding of Amin (1997) and Ashour (1998).

Burning of rice straw in this study gave low yield of wheat straw compared with other treatments.

3- Nitrogen concentration and uptake.

Data in Tables (5 and 6) indicate the results of rice straw treatment only and rice straw + NPK and its application with biofertilizer (Nitrobien) which slightly stimulate the concentration and uptake of N by wheat plants. Application of all the tested fertilizers treatments significantly increased the concentration of N.

Table (5): Effect of applied rice straw, chemical and biofertilizer on concentration and uptake of N in grain of wheat plants.

Treatment		Without biofertilizer		With biofertilizer	
		N%	N uptake, g/20 m^2	N%	N uptake, g/20 m^2
Without NPK	Control	2.10	141	2.21	156
	F. Straw	2.40	170	2.48	179
	Ash	2.30	156	2.38	166
	Compost	2.60	197	2.71	216
L.S.D. (0.01)		**0.09**	**4.81**	**0.09**	**7.15**
L.S.D. (0.05)		**0.06**	**3.35**	**0.07**	**4.97**
With NPK	Control	2.80	403	2.85	431
	F. Straw	2.90	427	2.94	485
	Ash	2.83	403	2.90	437
	Compost	3.10	490	3.21	546
L.S.D. (0.01)		**0.09**	**6.59**	**0.06**	**4.93**
L.S.D. (0.05)		**0.06**	**4.59**	**0.04**	**3.43**

An obvious improvement for the effect of organic matter was appeared with application of biofertilizers. Addition of chemical fertilizers (NPK) followed the influence of organic application either with or without the biofertilizer addition of all treatments compared with the control. However the combination of compost with chemical fertilizers and biofertilizer increased the N concentration and uptake of wheat plants compared with other treatments. The results for the effect of different fertilizers on the N concentration in different plants have been reported by Hassouna et al (1998) and Anga (2001).

Data in Table (5 & 6) illustrated the burning of straw rice in soil (ash treatments without chemical and biofertilizer) gave the low N concentration and uptake in grain compared with fresh straw and compost of straw treatments with or without NPK and biofertilizer but its treatment give increasing in parameter than control. While rice straw ash with application of chemical (NPK) or NPK + biofertilizer increased N concentration and uptake compared to control.

This might agree with Sharma (2002), who was found that N fertilizer applied along with wheat residue was more conserved and resulted in higher available N content in soil than N applied along with transplanting rice. The advantage of incorporation of wheat residue over its removal or burning was observed only when 40 kg N/ha was applied at the time of its incorporation.

Brar *et al.* (2000) also studied the effect of nitrogen and irrigation on the decomposition of combined harvested rice residue and consequently on stand establishment, growth and yield of succeeding wheat. They found that

application of extra nitrogen at 40 kg/ha + one irrigation at the time of incorporation of rice straw not only reduced the immobilization of available N but also resulted in quantum jump in wheat yield. All the growth and yield attributed to wheat (emergence count, plant height, effective tillers and grains per ear) significantly improved with additional nitrogen and irrigation compared to the farmers practice of residue burning or residue incorporation, followed by conventional tillage with recommended normal nitrogen fertilization and irrigation.

Naveen Kumar et al (2000) studied N-uptake by wheat (grain and straw) and phalaris minor Retz as influenced by rice-straw management techniques and weed control treatments in a rice wheat cropping system. Full incorporation (8t/ ha) and partial incorporation (6 t/ha) of rice straw gave significantly less uptake of nitrogen by wheat than removal and burning (8 t/ha) treatments.

Walia et al (1999) carried out field studies to study the effect of ash obtained by buring 5, 10, and 15 t/ha of rice straw, and its incorporation at 0-5, 0-10 and 0-15 cm soil depths on the efficacy of isoproturon for the control of phalaris minor. A decrease in bioefficacy of isoproturon was observed with increasing the quantity of ash obtained by burning rice straw from 5 to 15 t/ha and with decreasing the incorporation depth from 0-15 to 0-5 cm. on average no ash treatment (control) which gave 27.3, 26.9 and 35.5% more yield than wheat grown by shallow incorporation (0-5cm) of ash obtained by burning 5, 10 and 15 t/ha of rice straw, respectively. Similarly, N uptake by wheat decreased with an increase in ash quantity and with a decrease in the depth of incorporation.

Nitrogen uptake in Tables (5 &6) elucidate the same trend of N cncentation as affected by application of mineral , rice straw and biofertilizers similar results were obtained by Agwah (1993) and Harridy *et al.*, (1998). This may be attributed to the stimulating influence of the fertilizer on plant vegetative growth, consequently dry matter yield, N concentration and its uptake.

Table (6): Effect of applied organic, chemical and biofertilizer on concentration and uptake of N by Straw wheat plants.

Treatment		Without biofertilizer		With biofertilizer	
		N%	N uptake g/20 m^2	N%	N uptake g/20 m^2
Without NPK	Control	1.10	210	1.20	224
	F. Straw	1.20	227	1.30	248
	Ash	1.15	220	1.25	240
	Compost	1.43	314	1.45	334
L.S.D. (0.01)		**0.13**	**7.49**	**0.09**	**5.68**
L.S.D. (0.05)		**0.09**	**5.21**	**0.06**	**3.95**
With NPK	Control	1.68	444	1.70	488
	F. Straw	1.74	458	1.76	503
	Ash	1.65	404	1.69	480
	Compost	1.84	546	1.87	590
L.S.D. (0.01)		**0.10**	**6.27**	**0.05**	**6.92**
L.S.D. (0.05)		**0.07**	**4.36**	**0.03**	**4.81**

4- Phosphorus concentration and uptake:

The obtained result for the effect of rice straw (fresh, ash, and compost), chemical (N, P and K) and Biofertilizers and their interactions on the P concentration and uptake by wheat plants (grains and straw) are presented in Table (7 &8).

Data illustrated that application the tested fertilizers significantly increased the P concentration and uptake by grain and straw compared with control treatment. However compost treatment of rice straw gave increasing P concentration and uptake compared with the same treatments of other rice straw. Ash treatment gave lower increase than other treatments.

Table (7): Effect of applied rice straw, chemical and biofertilizer on concentration and uptake of P by grain of wheat plants.

Treatment		Without biofertilizer		With biofertilizer	
		P%	P uptake, g/20 m^2	P%	P uptake, g/20 m^2
Without NPK	Control	0.50	33.7	0.54	38.1
	F. Straw	0.54	38.2	0.58	41.6
	Ash	0.53	36.0	0.56	39.1
	Compost	0.58	44.0	0.63	50.4
L.S.D. (0.01)		**0.09 (NS)**	**2.32**	**0.03**	**1.89**
L.S.D. (0.05)		**0.06 (NS)**	**1.61**	**0.02**	**1.32**
With NPK	Control	0.61	87.7	0.65	98.3
	F. Straw	0.66	97.2	0.69	113.3
	Ash	0.64	91.2	0.68	102.8
	Compost	0.70	110.0	0.73	124.0
L.S.D. (0.01)		**0.03**	**2.08**	**0.03**	**2.89**
L.S.D. (0.05)		**0.02**	**1.45**	**0.02**	**2.01**

Table (8): Effect of applied rice straw, chemical and biofertilizer on concentration and uptake of P by straw of wheat plants.

Treatment		Without biofertilizer		With biofertilizer	
		P%	P uptake, g/20 m^2	P%	P uptake, g/20 m^2
Without NPK	Control	0.32	61.075	0.33	61.55
	F. Straw	0.43	81.5	0.45	86
	Ash	0.41	78.6	0.42	80.8
	Compost	0.48	105.25	0.51	117
L.S.D. (0.01)		**0.03**	**1.86**	**0.01**	**2.55**
L.S.D. (0.05)		**0.02**	**1.30**	**0.01**	**1.78**
With NPK	Control	0.36	95.2	0.37	106.25
	F. Straw	0.45	117.75	0.46	131.75
	Ash	0.43	105	0.45	128
	Compost	0.52	154	0.60	189
L.S.D. (0.01)		**0.01**	**3.76**	**0.04**	**1.71**
L.S.D. (0.05)		**0.01**	**2.62**	**0.03**	**1.19**

Data in Table (7&8) showed that the application of organic with chemical (NPK) fertilizer gave highest value than without it. While inoculation grains of wheat by biofertilizer (Nitrobien) with rice straw only or with chemical gave the highest significantly increasing of P concentration and uptake

compared with non inoculation. The enhancing effect of rice straw, chemical and biofertilizers on P concentration and P uptake may be due to its effect on increasing the availability of the added phosphorus and other nutrient in soil, (Ashour, 1998 and Nassar *et al.*, 2000).

Data in tables (7&8) reveal that burning rice straw and incorporated into soil on open field to soil conditioners gave decreases of P concentration and uptake by wheat plants were planting in clay soil in the same treatment organic or chemical or bio+ organic or chemical fertilizer. They attributed to died of microflora in soil and increase heat of soil and added of heavy metal concentration it effective to all parameter.

5- Potassium concentration and uptake:

Data in Table (9 & 10) illustrated that application of rice straw, chemical and biofertilizer increased potassium (K) concentration and uptake by wheat plants (grain and straw). Non inoculation of biofertilizer treatment gave the lowest increase of K concentration and uptake compared with other treatments.

Application of chemical (NPK) fertilizer followed the influence of the organic applications either alone or with biofertilizers addition.

The data also revealed that application of rice straw + chemical (NPK) fertilizer under biofertilizer gave the highest significant increases of K concentration and uptake by wheat plants. This may be due to the stimulating effect of theses fertilizers on the plant growth. Where the bulk of potassium is mainly taken up during the vegetative growth stage consequently, increasing and uptake this increase in the K uptake can also be occurred as a result of enhancing the metabolic activity of the plant root when mineral nutrient are supplied through the fertilizers application into the soil.

The aforementioned stimulating effect of mineral, organic and biofertilizer on the uptake of the K by plants are in consonance with results obtained by Lin *et al* (1983) and Kapulnik et al (1985a,b and 1987). While burning rice straw in soil and incorporated into the soil to effective of K concentration and uptake give the same trend other parameters.

Table (9): Effect of applied rice straw, chemical and biofertilizer on concentration and uptake of K by grain of wheat plants.

Treatment		Without biofertilizer		With biofertilizer	
		K%	K uptake, g/20 m^2	K%	K uptake, g/20 m^2
Without NPK	Control	1.58	141	1.62	288
	F. Straw	1.62	170	1.64	309
	Ash	1.60	156	1.63	299.25
	Compost	1.67	197	1.71	346
L.S.D. (0.01)		**0.03**	**4.81**	**0.02**	**5.20**
L.S.D. (0.05)		**0.02**	**3.35**	**0.02**	**3.62**
With NPK	Control	2.00	106	2.05	114
	F. Straw	2.15	115	2.18	118
	Ash	2.10	109	2.11	114
	Compost	2.25	127	2.35	137
L.S.D. (0.01)		**0.04**	**3.55**	**0.06**	**4.78**
L.S.D. (0.05)		**0.03**	**2.47**	**0.04**	**3.33**

Table (10): Effect of applied rice straw, chemical and biofertilizer on concentration and uptake of K by straw of wheat plants.

Treatment		Without biofertilizer		With biofertilizer	
		K%	K uptake, g/20 m^2	K%	K uptake, g/20 m^2
Without NPK	Control	1.83	310	1.87	349
	F. Straw	1.89	359	1.90	363
	Ash	1.83	318	1.88	362
	Compost	1.92	468	1.98	455
L.S.D. (0.01)		**0.01**	**7.91**	**0.02**	**6.25**
L.S.D. (0.05)		**0.01**	**5.50**	**0.01**	**4.35**
With NPK	Control	1.98	524	2.10	603
	F. Straw	2.20	579	2.30	657
	Ash	2.18	534	2.25	639
	Compost	2.30	682	2.38	750
L.S.D. (0.01)		**0.06**	**4.33**	**0.03**	**5.33**
L.S.D. (0.05)		**0.04**	**3.02**	**0.02**	**3.71**

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تأثير إضافة صور مختلفة لقش الأرز مع أو بدون إضافة أسمدة معدنية (ن، فو، بو) أو/و الأسمدة الحيوية على محصول القمح بالأرض الطينية.

السيد محمود النجار[1] و أيمن محمد الغمري[2]

المركز المصري لتطوير الأسمدة- المنصورة - مصر ١

قسم الأراضي – جامعة المنصورة- كلية الزراعة –مصر٢

اقيمت تجربة حقلية في أراضي طينية بقرية منشأة عبد الرحمن – مركز دكرنس – محافظة الدقهلية أثناء موسم شتاء عام ٢٠٠٢/٢٠٠٣ لدراسة تأثير إضافة قش الأرز إما الطازج أو المحروق او المصنع منه ككومبوست على الأراضي الطينية مع أو بدون استخدام سماد حيوي (النيتروبين) وأسمدة نيتروجينية وفوسفاتية وبوتاسية معدنية على محصول (حبوب – قش) وتركيز وإمتصاص عناصر النيتروجين والفوسفور والبوتاسيوم في نبات القمح.

التجربة مكونة من ١٦ معاملة (٤ معاملات هي: كنترول – قش طازج – قش محروق –كومبوست قش) مع وبدون أسمدة حيوية أو بإضافة أسمدة معدنية أو عدم إضافتها.

صممت التجربة كتجربة عاملية في قطاعات كاملة العشوائية مع أربعة مكررات. تم دراسة ثلاث عوامل هي (القش – القش المحروق – الكومبوست) و الأسمدة الكيماوية (النيتروجينية – الفوسفاتية – البوتاسية) والسماد الحيوي (أزوسبيريليم) والتفاعل بينهم حيث كانت هناك فروق معنوية موجبة.

أظهرت نتائج محصول القمح وجود تأثير معنوي عند إضافة الأسمدة الحيوية والكيماوية.

كما وجد زيادة في محصول الحبوب والقش لنبات القمح وكذلك محتوى العناصر الكبري (النيتروجين – الفوسفور – البوتاسيوم) في كل من الحبوب والقش عند الحصاد مع المعاملة بالكومبوست المصنع من قش الأرز.

وجدت أكثر زيادة في إنتاج القمح مع إضافة الأسمدة الحيوية. كما كان أقل إنتاج للقمح يرجع إلى استخدام قش الأرز المحروق مع أو بدون الأسمدة الحيوية والمعدنية. توصى الدراسة باستخدام الكومبوست المصنع من قش الأرز مع الأسمدة الحيوية والكيماوية وذلك لتقليل التلوث الذي يرجع إلى حرق الأرز وتكوين ما يعرف بالسحابة السوداء.