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Influence of Rice Straw Extract and Amino Acids on the Growth, Yield and Chemical Parameters of some Crops

Mervat A. Hamed; Shreen S. Ahmed* and Wafaa A. Hafez

Soils, Water and Environment Research Institute, ARC, Giza, Egypt

ABSTRACT

There is increasing concern about environmental contamination risks associated with the extensive use of mineral fertilizer in crops production. The aim of this study is to evaluate rice straw extract as natural fertilizer and suitable alternative to nitrogen mineral fertilizer. Two successive field experiments were carried out at Giza, Agricultural Research Station, during two seasons of summer and winter /2015/2016 to study the effect of rice straw extract as soil addition and soaking seed with or without amino acids on yield of maize and wheat crops. Maize and wheat seeds were soaked in aqueous solution of rice straw extract without or with amino acids for 6, 12, 24 hours. The results indicated that there are significant differences between average of grain and biological yield of maize (15.59 and 23.56 t/ha), protein yield (1934.37 kg/ha) and N, P uptake (322.97, 129.4 kg/ha) by application of rice straw extract and seed soaking for 12 hours in rice straw extract mixed with amino acids as natural fertilizer compared to nitrogen fertilizer. Contrary, maize is better adapted and produce more yield than wheat, the data regarding grain and straw yield of wheat (8.97 and 22.1 t/ha) and protein yield (1256.91 kg/ha) and N uptake (228.45 kg/ha) was observed by application of rice straw extract and seed soaking for 6 hours with rice straw extract only compared to nitrogen fertilizer. It can be concluded that rice straw extract as natural fertilizer with or without amino acids could be suitable alternative to nitrogen mineral fertilizers.

Keywords: rice straw extract, soaking seed, wheat, maize, amino acids.

INTRODUCTION

There is increasing concern about human health and environmental contamination risks associated with the extensive use of nitrogen mineral fertilizer in crops production. Therefore, the aim of this study is to evaluate rice straw extract as natural fertilizer and suitable alternative to nitrogen mineral fertilizer. There is a general awareness in Egypt that field burning of straw, in particular rice unacceptable air quality. This is partly brought about by recent reports on what is locally known as "the Black Cloud" in the media, newspaper and etc. In view of this, with the future in mined it behaves us to learn to find ways of learning to live with this problem. In view of this, and thought the current work, the others are actively engaged in finding new ways of utilizing rice straw in a beneficial and environmentaly sustainable way. Further, a new approach for utilizing rice straw as N-fertilizer source instead of the mineral one was applied through indicted some field trails, in many cases further product development is necessary, both to improve products but also the economy of the process in order to make them more economicaly attractive. For those technologies that have reached maturity, further demonstration and extension is needed in addition, while there are many initiatives such as pilot and demonstration projects on alternative rice straw utilization, these initiatives are generally fragmentized, and projects seem not linked. A more integrate approach is therefore required. Other recognized challenges of beneficial rice straw metallization are the access to regular supply of rice straw through long term agreement with farmers, and the cost associated to transportation and potential risk of price increase as value of rice straw is recognized. Finally, attempts to increase recycling and utilization of rice straw can serve as example of using other crop waste as liquid fertilizer.

Presently liquid fertilizer is a well-known and very important agricultural fertilizer. Various organic wastes such as vegetable, fruits, and other foods can be used as substrate for producing liquid fertilizer. General properties of liquid fertilizer are as follows: (1) the value of electrical conductivity is between 2-12 (dS/m), (2) pH value is between 3.5-5.6, (3) C/N ratio is between 1/2 -70/1, (4) for the fermented plant extract: % total nitrogen is between 0.03-1.66%, % total P_2O_5 is between 0-4%, water soluble K_2O is between 0.05-3.53%, (5) amino acids, (6) plant growth hormones (Chaisut .,2007).

The amino acids (biostimulants) may reduce the application of fertilizers and improve the quality of some plants. Biostimulants work by increasing plant mineral uptake and improving the nutrients use efficiency (Vernieri *et al*., 2005). In addition, the amino acids increased the concentration of ascorbic acid, accelerated protein synthesis, moreover, promoted plant growth and yield formation (Alaru *et al*., 2003; Meijer, 2003).

Soaking seed has been found a double technology to enhance rapid and uniform emergence, and to achieve high vigor and better yields in field corps (Giri, and Schillinger, 2005, Farooq, *et al*, 2007). Patra (2019) stated that seed soaking with water in cereal crops especially wheat and rice has been found to be better in mitigating the detrimental effect of adverse climatic conditions. The effects of seed soaking on crops are dependent on the complex interaction of factors such as soak substance, plant genotype, and soak

* **Corresponding author.**
E-mail address: shreenashraf@gmail.com
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duration. Germination and seedling establishment are influential stages which affected both quality and quantity of crop yields (Parera, and Cantliffe, 1994). Many studies have been carried out on the effect of seed soak on germination and growth rate of corps. Chiu *et al*., (2002) enhanced germination in sweet zea Maize when primed using polyethylene glycol. Suhaidi (2003) suggested that soaking lead to changes in the biology of the breakdown of the various components into simpler compounds. However, during germination, protease enzyme increases and is involved in the degradation of peptide component to amino acids and the amount of protein will increase. This study aims to use natural alternatives to nitrogenous fertilizers and to evaluate the use of mixed or unmixed rice straw extract with plant-based amino acids on the yield and quality of maize and wheat crops.

MATERIALS AND METHODS

Field trails:

In addition to the above mentioned of the numerous alternative concepts and technologies for beneficial utilization of rice straw under the literature review, field trails were conducted. The aim of the current work is to apply a new approach for utilization the extract water of rice straw residues as N-fertilizer source as well as the impact of soaking crop seeds before seedling on the yield production and quality.

Preparation of the aqueous rice straw extract:

Dry rice straw was collected at harvesting stage dried, chopped into about 5 cm pieces, and then prepared as tea bags. Each bag was individually soaked in liter of tab water for 24 hours at room temperature in ratio of 50 g/L. The chemical composition of this extract is given in Table (1).

Table.1. chemical composition of rice straw extract.

Components	Value
T.N%	0.46
**S. NO_3--%	0.004
**S. NH_4+%	0.008

***T means: Total**
****S means: soluble**

Field Experiment:

The field experiment was conducted within two successive seasons during the agricultural year (2015/ 2016) at the Experimental Farm of Agriculture Research Center, El-Giza Governorate. Table (2) shows some physical and chemical properties of the experimental soil. The experiment started with maize crop (hybride 10) followed by wheat crop (sakha 94).

Table 2. Some selected properties of studied soil

Characteristic	O.M %	pH (1:2.5)	EC dS/m	N available mg /Kg	P available mg /Kg	K available mg /Kg	Sand %	Silt %	Clay %	Texture soil
Value	1.42	7.85	1.34	84.4	24.8	167	12.04	45.45	42.51	Silty clay

The experiment under maize or wheat crop includes eight treatments, done as shown in Table.3.

Table 3. Description of applied treatments on wheat and maize crops

No	N source	Soaking	
		Solution	Time
T1	Rice straw extract	-	0
T2		Rice straw extract	6 hours
T3			12 hours
T4			24 hours
T5		Rice straw extract + amino acids	6 hours
T6			12 hours
T7			24 hours
T8	Mineral	-	-

The experiment was arranged in arandomized complete block design (RCBD) with three replicates. The plot area was 6 m^2 (2x3 m) for each treatment as well as the control. All soil plots were fertilized with the recommended rates of P and K for maize or wheat. Some of the experiment seed of maize or wheat were soaked for 6, 12, and 24 hours in rice straw extract either mixed or without mixing with amino acids. The mixing rate was (1:10) amino acids and rice straw extract, respectively.

Amino acid was prepared in the lab from soybean meal. The rice straw extract was added for each plot based on available nitrogen in the extract and recommendation of N fertilizer for the crop.

The other required cultural practices for the tested crop were followed as recommended. Representative sample of maize and wheat grain were collected from each plot was air dried and prepared for chemical analysis. However, all plant for each plot were harvested and the grain and biological yield (t/ha) were calculated.

Analytic methods:

Some physical and chemical characteristics of the studied soils were determined according to Page *et al*, (1982). Total carbohydrate was extracted (Smith *et al*. 1964) and determined using spectrophotometer (Murphy, 1958). Protein was estimated by multiplying N with the factor 6.25 while N was determined by semi-micro Kjeldahl method (AOAC, 1970). Phosphorus was determined by vanadomolybdate yellow method spectrophotometrically, K by flame photometer (Jackson, 1973). All determinations were performed in triplicate and data represented on dry weight basis as mean values ± standard deviations.

Statistical Analysis:

All data were statistically analyzed using Mstat C computer program according to procedures outlined by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

1- Effect of soaking period in rice straw extract (with or without amino acids) on the yield and some quality parameters of maize.

The result of the present study indicated that grain yield and some quality parameters were significantly affected by the soaking period in rice straw extract or rice straw extract mixing amino acid (Table 4). The highest grain and biological yield and protein 15.59, 23.56 t/ha and 12.94%, respectively, were obtained from T6 (12 hours soaking with rice straw extract and mixing amino acids) compared to T1 (without soaking or zero time soaking), from results obtained that the application of soaking seeds

in rice straw extract solution mixing with amino acid for 12 hours had positive effect on yield quality as compared to other treatments. These results are in agreement with those obtained by. Somayeh Ghalichechi and Maryam Gasht Azar (2013) reported that seed Amino acid soak duration of 12 hr produced maximum value for most of the germination and early seedling growth characteristics of Zea maize. While the lowest yield was obtained 7.51 t/ha, in T4 (24 hours soaking with rice straw extract only compared to T1 (zero time soaking). The highest value of oil content was observed in T5 (6.54 %), while T7 (24 hours soaking with rice straw extract mixed amino acids) had the lower protein and oil content (8.75% and 5.73%) compared to other treatments. Results showed that the high amounts of carbohydrate in T4 (72.69%), while the lowest quantity of carbohydrate was obtained in T6 (45.47%), results showed that the relationship between carbohydrate content and grain yield was negative. In line with the results in the present study, *Qurban Ali et al*, (2011) who reported that Carbohydrates were negative and non-significantly correlated with grain yield per plant at both genotypic and phenotypic levels, the carbohydrates per plant had negative direct effects on grain yield. Nitrogen concentration varied significantly from 1.44% in T7 (24 hours soaking with rice straw extract mixed A.A) to 2.12% in T2 (soaking for 6 hours with rice straw extract only) in grain maize. Increased soaking periods showed increased significantly the concentration of P and K in T4 (24 hours soaking with rice straw extract only) (0.191 % and 0.47%), respectively, compared with control treatment T1 (zero time soaking) (0.141% and 0.32%), respectively.

Table 4. Effect of soaking periods in rice straw extract (with or without mixing) with amino acids on the yield (grain and biological) and some quality parameters of maize grain.

Type soaking	Time of soaking(hours)	Grain yield t/ha	Biological Yield t/ha	Some quality parameters of maize grain					
				protein %	Oil content %	Carboh-ydrate %	N%	P%	K%
RSE	0	8.4	10.52	10.59	6.35	65.46	1.69	0.71	0.32
	6	10.45	18.55	12.89	6	57.36	2.05	0.62	0.39
	12	14.24	21.86	9.19	6.38	54.16	1.47	0.73	0.39
	24	7.51	19.22	11.25	5.93	72.69	1.8	0.84	0.45
Mean		10.15	17.54	10.98	6.17	62.42	1.75	0.73	0.39
RSE + A.A	0	8.4	10.52	10.59	6.35	65.46	1.69	0.71	0.32
	6	10.36	15.16	10.69	6.54	60.56	1.71	0.69	0.35
	12	15.59	23.56	12.94	6.24	45.47	2.11	0.83	0.31
	24	11.22	21.12	8.75	5.73	56.29	1.4	0.85	0.45
Mean		11.39	17.59	10.74	6.22	56.95	1.73	0.77	0.36
$LSD_{0.05}$	A	*	ns	*	ns	*	ns	Ns	ns
	B	0.56	1.19	0.48	0.97	3.67	0.05	0.07	0.08
	A*B	0.79	1.68	0.68	1.37	5.19	0.08	0.09	0.11

RSE means: rice straw extract AA means: amino acid

2- Effect of soaking periods in rice straw extract (with or without amino acids) on the yield and some quality parameters of wheat:

Quality of wheat yield due to application of soaking seeds with rice straw extract alone or combined with amino acids are given in Table.5. The obtained results indicate that the highest wheat grain yield (8.97 t/ha) was obtained from T2 (6 hours soaking with rice straw extract alone) fallowed T5 (6 hours and rice straw extract mixing amino acid) (8.46 t/ha), compared to T1 (zero time soaking) (4.01 t/ha). There are significant differences regarding the straw yield and its attributes were recorded between the T1 (zero time soaking) (14.06 t/ha), T2 (6 hours soaking with rice straw extract alone) ((22.1 t/ha), and T5 (6 hours and rice straw extract mixing amino acid) (20.94 t/ha). While the lowest grain yield was obtained (4.67 t/ha) in T6 and T7 (12 or 24 hours soaking with rice straw extract mixing with amino acids), and the lowest straw yield was obtained (9.54 t/ha) in T7, from results obtained that the application of soaking seeds in rice straw extract solution mixing with amino acid for 24 hours had negative effect on yield quality as compared to other treatments. These results are in agreement with those obtained mentioned that wheat straw extract has phenolic compounds that appear to have toxic effects on corn seedlings (Weih *et al*, 2008). From Previous studies reported by Street and Helji, (1991) which was attributed to prolong soaking that to increase carbon dioxide, ethanol and lactic acids concentrations in seeds and reduced that of oxygen leading to poor growth compared to other periods, may be due to the reality that wheat plants straw aqueous extracts may contain allelopathic compounds that affect the growth of weed plants (Opoku *et al*., 1997). The protein content in grain of wheat was significantly increased in T2 (14.03%) compared to other treatments and T1 (zero time soaking), while in T7 (24 hours soaking with rice straw extract mixing with amino acids) had the lower protein content (11.83%) than other treatments, probably due to dilution of protein by non-nitrogen compounds and reduced starch accumulation in the grain. Many studies have focused on the relationship between protein content and grain yield. The high amounts of carbohydrate in T4 (60.85%), while, the lowest quantity of carbohydrate was obtained in T6 (48.26%). Contents of some macronutrients in grains of wheat plants soaked with rice straw extract alone or combined with amino acids for 6, 12 and 24 hours given in Table (5). The obtained results indicated significant increases in nitrogen, in T2 (2.55%) compared to T1 (zero time soaking) while the lowest quantity of nitrogen was in T7 (2.15%). The concentrations of P in grain in treatment T5 (0.829 %) was significantly higher compared with treatment T1 (0.602 %). Phosphorus concentration in treatment T2 was the lowest value (0.554%) compared with other treatments. indicate clearly that there are no significant differences were noticed between average of Potassium concentration between treatments except T5 and T7 (soaking 6 or 24 hours and rice straw extract mixing amino acid). The obtained results indicated significant increases in potassium (0.51%).

Table 5. Effect of soaking periods in rice straw extract (with or without mixing) with amino acids on the yield (grain and straw) and some quality parameters of wheat grain.

Type soaking	Time of soaking (hours)	Grain yield t/ha	Straw Yield t/ha	Some quality parameters of maize grain				
				protein %	Carbohydrate %	N %	P %	K %
RSE	0	4.01	14.06	12.76	55.35	2.32	0.60	0.46
	6	8.97	22.1	14.03	50.24	2.55	0.55	0.44
	12	6.97	15.69	13.39	51.51	2.43	0.56	0.43
	24	5.28	12.92	12.61	60.85	2.29	0.59	0.45
Mean		6.31	16.19	13.19	54.49	2.39	0.58	0.45
RSE + A.A	0	4.01	14.06	12.76	55.35	2.32	0.60	0.46
	6	8.46	20.94	12.76	58.04	2.32	0.83	0.51
	12	4.67	15.12	12.27	48.26	2.23	0.72	0.43
	24	4.67	9.54	11.83	51.87	2.15	0.71	0.51
Mean		5.45	14.92	12.41	53.38	2.26	0.72	0.48
$LSD_{0.05}$	A	ns	ns	ns	ns	ns	*	ns
	B	0.47	1.36	0.76	5.50	0.14	0.04	0.07
	A*B	0.66	1.93	1.07	7.78	0.19	0.05	0.09

Means of each column with different letters are significantly different at P≤0.05 RSE means: rice straw extract
AA means: amino acid

3- Effect of rice straw extract with or without amino acids on the yield and some quality parameters of wheat and maize crops

From the results presented in Tables 4 and 5 showed that there are significant differences between effects of soaking media rice straw extract either was with or without amino acids, and between maize and wheat. The results recorded the highest value of grain of maize was increased significantly 11.39 t/ha in with amino acids compared to without amino acids 10.15 t/ha, but there was no significant difference between two treatments in biological yield. These results are supported by the findings of (Khan, M., N.A. and Khan Samiullah, 2001) reported that application of 0.02% amino acid for both mustard and Zea maize gave maximum value for growth and yield parameters. Ansari and Khan (1986) reported that seed soaking application of graded aqueous amino acid solutions increased the dry matter accumulation of mung bean. Soaking seed with rice straw extract showed a maximum value of carbohydrate 62.42 % in without amino acids compared to with amino acids 56.94 %, while there were no significant difference between two treatments in oil and protein content in grain maize. The obtained results indicated that there were no significant in nitrogen, phosphorus and potassium in soaking seed with rice straw extract with or without amino acids. It is clear from the results that the maize responded to addition of amino acids where this treatment gave higher values for grain, whereas there were no significant difference between two treatments in biological yield, as well as, protein, oil content, nitrogen, phosphorus and potassium, but, there were significant increase in carbohydrate content in soaking seed with rice straw extract only compared to with amino acids. On the contrary, the wheat seed soaking with mixed rice straw extract and amino acids respectively produced significantly maximum grain and straw yield (6.31 and 16.19 t/ha) in rice straw extract alone compared to mixed amino acids (5.45 and 14.92 t/ha). The highest value of seed protein content and carbohydrate (13.19 and 54.49%) in wheat was in soaking seed rice straw extract alone without amino acids compared to (12.41 and 53.38%) in soaking seed in with mixed rice straw extract and amino acids. whereas, nutrients containing, 2.40% N in seed soaking with (rice straw extract alone) decreased to 2.26% in mixed with amino acids. The obtained results indicated significant increases in phosphorus in soaking seed with mixed rice straw extract and amino acids (0.72 %) compared to without mixed amino acids (0.58%), respectively but there were not significant difference between two treatments in 0.45 and 0.48 K %, respectively. It is clear from the results that the wheat did not respond addition of amino acids where this treatment gave lower values for grain yield and straw, as well as carbohydrates, protein and nitrogen content.

4- Effect of N fertilizer source on the yield and some quality parameters of maize and wheat crops

The results indicate clearly that there are significant differences between average of grain and biological yield of maize (Figures 1 and 2) which reached the maximum with T6 which resulted in significant increase averaged 30.91 and 12.18 % compared to T8 (100% NPK mineral fertilizers) whereas, T2 (rice straw extract as natural fertilizer and seed soaking 6 hours with rice straw extract only) showed a significant increase averaged 13.82 and 29 % in grain and straw yield of wheat compared to 100% NPK mineral fertilizers. The increase in the grain and biological can be attributed to set of growth regulators compound contained in those extracts. These results were in agreement with those obtained by (Farooq *et al*., 2008) who reported that the extracts obtained from some crop and tree residues have been reported to play roles in crop growth and yield. Plant extracts are rich in amino acids, vitamins and growth stimulating photo-hormones that increases the activity of apical meristem tissue resulting in cell division and elongation (Singh. 2013). Mercy *et al*. (2014) found that the application of fruit peel powder and extract increased the growth of plants (rice, rye, mustard and fenugreek) and gave the higher yields. Jabran *et al.* (2008) also stated that the increase in grain yield over control was due to control of weeds, moreover probably the allelopathic effects of crop water extracts also promoted the wheat growth which ultimately increases grain yield.

The highest protein yield (Figure 3) of the maize grain was (1934.37 kg/ha) in T6 compared to T8 (1071.19 kg/ha) in plot fertilized with NPK mineral fertilizer. While the highest amount of protein yield in the grain of wheat was 1256.91 kg/ha in T2 (rice straw extract and seed soaking 6 hours with rice straw extract only) compared to T8 (NPK mineral fertilizers) (1044.99 kg/ha).

The content of soluble carbohydrates (Figure 4) is an important determinant of maize quality, the carbohydrates yield in grain maize was by application rice straw extract with soaking 12 hours in rice straw extract only (T3) showed a maximum accumulation of carbohydrate yield in grain maize (7706.59 kg/ha) compared to (T8) NPK mineral fertilizers (6183.79 kg/ha). The highest value of carbohydrates yield in grain wheat was (4894.32 kg/ha) in T5 (rice straw extract and seed soaking 6 hours with rice straw extract mixed amino acids) compared to T8 (NPK mineral fertilizer) (3470.49 kg/ha).

The highest value of seed oil yield (Figure 5) in maize was in T5 (1063.06 kg/ha) fertilized with rice straw extract and seed soaking 6 hours rice straw extract mixed amino acids compared to T8 (677.74 kg/ha) fertilized with NPK mineral fertilizer.

Nutrients containing in grain maize, there were significant difference in N uptake (Figure 6) between treatments, results indicated that the highest value of N uptake was in T6 (fertilized with rice straw extract and seed soaking 12 hours with amino acids) (322.97 kg/ha) compared to T8 (fertilized with NPK mineral fertilizers) (240.31 kg/ha).

The highest value of P uptake (Figure 7) was 129.4 kg/ha at T6 (fertilized with rice straw extract and seed soaking 12 hours with amino acids) compared to T8 (fertilized with NPK mineral fertilizer) (80.42 kg/ha).

Whereas Figure 8 observed the highest value of K uptake (55.27 kg/ha) was in T3 (fertilized with rice straw extract and seed soaking 12 hours only) compared to T8 (fertilized with NPK mineral fertilizer) (39.53 kg/ha).

Also, the experimental results showed that there were significant differences in N, P, and K uptake in grain wheat between treatments. The highest value of N uptake in grain wheat was (288.45 kg/ha) in T2 (fertilized with rice straw extract and seed soaking 6 hours with rice straw extract only) compared to T8 (fertilized with NPK mineral fertilizer) (189.95 kg/ha). The highest value of P and K uptake (70.17 and 41.89 kg/ha) was in T5 (fertilized with rice straw extract and seed soaking 6 hours rice straw extract mixed amino acids) compared to T8 (fertilized with NPK mineral fertilizer) (62.7 and 23.79 kg/ha), respectively.

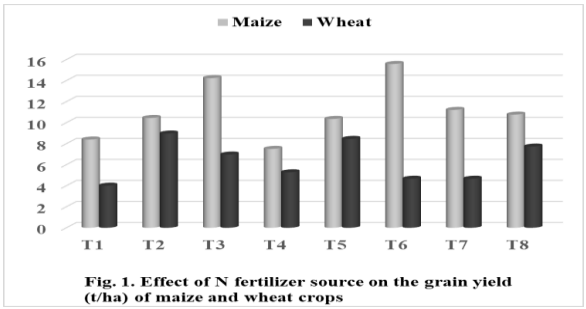

Fig. 1. Effect of N fertilizer source on the grain yield (t/ha) of maize and wheat crops

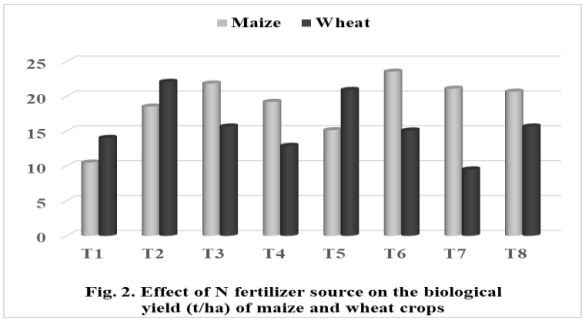

Fig. 2. Effect of N fertilizer source on the biological yield (t/ha) of maize and wheat crops

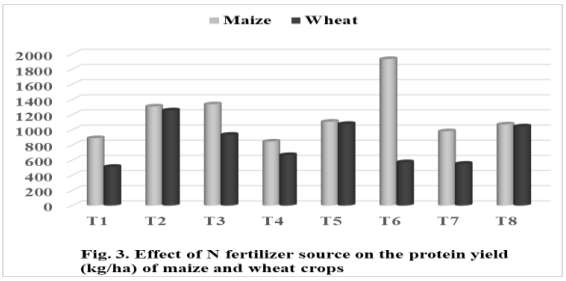

Fig. 3. Effect of N fertilizer source on the protein yield (kg/ha) of maize and wheat crops

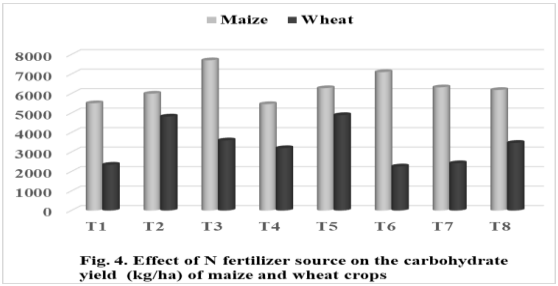

Fig. 4. Effect of N fertilizer source on the carbohydrate yield (kg/ha) of maize and wheat crops

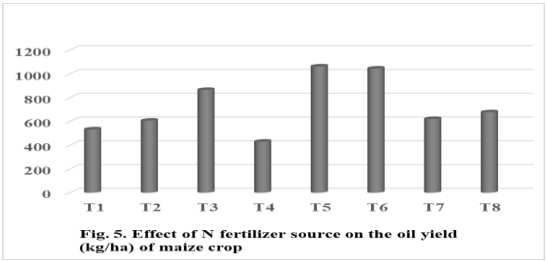

Fig. 5. Effect of N fertilizer source on the oil yield (kg/ha) of maize crop

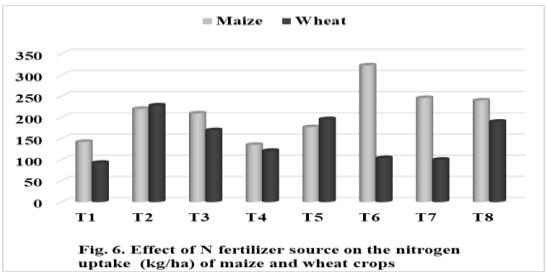

Fig. 6. Effect of N fertilizer source on the nitrogen uptake (kg/ha) of maize and wheat crops

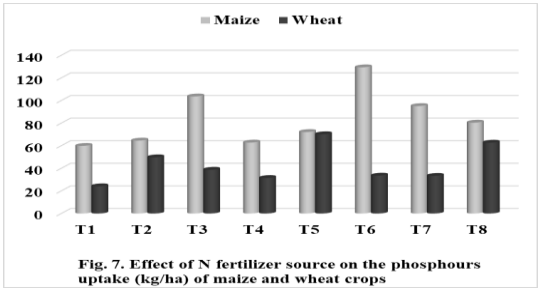

Fig. 7. Effect of N fertilizer source on the phosphours uptake (kg/ha) of maize and wheat crops

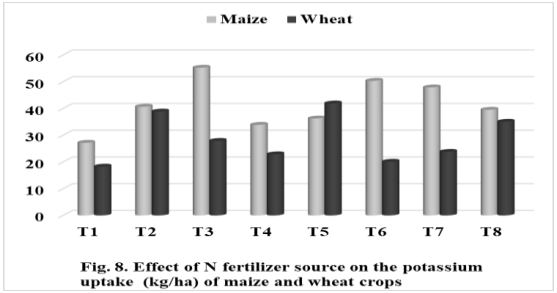

Fig. 8. Effect of N fertilizer source on the potassium uptake (kg/ha) of maize and wheat crops

CONCLUSION

It can be concluded from these results that a positive effect was observed on yield and chemical composition by using rice straw extract as a soil addition or/and seed soaking with or without amino acids of the two crops. maize showed

greater response to rice straw extract in grain yield and oil yield through rice straw extract application as fertilizers and soaking 6 and 12 hours with rice straw extract mixed amino acids at T5 and T6, respectively, compared to mineral fertilizer. Contrary, wheat showed lesser response than maize to rice straw extract as fertilizer in grain yield compared to mineral fertilizer, the highest value of grain yield was in T2 (rice straw extract as natural fertilizer and seed soaking 6 hours with rice straw extract without amino acids), compared to mineral fertilizers. From the results of field experiments, it is concluded that increase in crop yields in response to rice straw extract or amino acids treatment depends on the frequency of soaking time, soaking of media variety and the type of crop species.

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تأثير مستخلص قش الأرز والأحماض الأمينية على النمو والمحصول والصفات الكيميائية لبعض المحاصيل

مرفت اسعد حامد ، شرين سامى أحمد و وفاءعبد الكريم حافظ

معهد بحوث الاراضى والمياه والبيئة مركز البحوث الزراعية

هناك قلق متزايد بشأن صحة الإنسان ومخاطر التلوث البيئي المرتبطة بالاستخدام المكثف للأسمدة المعدنية النيتروجينية في إنتاج المحاصيل. لذلك فإن الهدف من هذه الدراسة هو تقييم مستخلص قش الأرز كسماد طبيعي وبديل مناسب للأسمدة المعدنية الآزوتية. أجريت تجربتان ميدانيتان متتاليتان بمحطة البحوث الزراعية بالجيزة خلال موسمي صيف وشتاء ٢٠١٥/٢٠١٦ لدراسة تأثير مستخلص قش الأرز كإضافة للتربة ونقع البذور مع أو بدون الأحماض الأمينية على نمو وإنتاجية محاصيل الذرة والقمح. تم تسميد جميع قطع التجربة بالمعدلات الموصى بها من الفوسفور والبوتاسيوم ونقع بذور الذرة والقمح في محلول مائي من مستخلص قش الأرز بدون أو مع الأحماض الأمينية لمدة ٦ ، ١٢ ، ٢٤ ساعة. أشارت النتائج إلى وجود فروق ذات دلالة إحصائية بين متوسط محصول الحبوب والمحصول البيولوجي للذرة (١٥,٥٩ و ٢٣,٥٦ طن / هكتار) ومحصول البروتين (١٩٣٤,٣٧ كجم / هكتار) وامتصاص النيتروجين والفوسفور (٣٢٢,٩٧ ، ١٢٩,٤ كجم / هكتار عند أضافة مستخلص قش الأرز ونقع البذور لمدة ١٢ ساعة في مستخلص قش الأرز الممزوج بالأحماض الأمينية كسماد طبيعي مقارنة بالسماد المعدني النيتروجيني. على النقيض من ذلك ، تعد الذرة أكثر تكيفًا وتنتج محصولًا أكثر من القمح ، وقد لوحظت البيانات المتعلقة بمحصول الحبوب والقش للقمح (٨,٩٧ و ٢٢,١ طن / هكتار) ومحصول البروتين (١٢٥٦,٩١ كجم / هكتار) وامتصاص النيتروجين (٢٢٨,٤٥ كجم / هكتار) عن طريق وضع مستخلص قش الأرز ونقع البذور لمدة ٦ ساعات مع مستخلص قش الأرز فقط مقارنة بالسماد المعدني النيتروجين. يمكن الاستنتاج أن مستخلص قش الأرز كسماد طبيعي ونقع البذور بمستخلص قش الأرز سواء مع أو بدون الأحماض الأمينية يمكن أن يكون بديلاً مناسبًا للأسمدة المعدنية .