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RESEARCH ARTICLE

Evaluation the effect of manufactured bio-organic fertilizer on wheat (*Triticum aestivum* L.) growth

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Abstract

Agri Coll is a bio-organic fertilizer which manufactured in Soil and Water department, Faculty of Agriculture, Assiut University. A field experiment was conducted in two consecutive seasons (2020/2021 and 2021/2022) to study and evaluate the effect of Agri coll on wheat (*Triticum aestivum* L.) yield and its components. It was added with irrigation water (fertigation). Treatments include two levels of Agri coll (50 and 100 L/ fed) and recommended dose of mineral fertilizer (nitrogen 100 kg N/ fed, phosphorus 100 kg/fed and potassium level 48 kg/ K_2O) as a control treatment, as well as their combinations. The experiment was designed as a completely random block with four replicates. Results showed that using of Agri coll with irrigation water recorded increases in the yield of wheat straw, grains, improves yield and its components and concentration of some nutrients. Grain yield increased by 7.33 and 15.38% in the first season and 9.09 and 15.77 % in the second season by addition of 50 and 100 liters / Agir coll respectively. Agri coll applications increased soil nutrients available form and wheat nutrients content compared with control treatment. The obtained results suggest that the manufactured has high potential as a good source of minerals and organic matter and can be substituted with the mineral fertilizers required for optimal crop yield, growth parameters and concentrations of essential nutrients in wheat (*Triticum aestivum* L.).

Keywords: Bio- fertilizer; Fertigation; Mineral fertilizer; Nutrients; Organic fertilizer.

1. Introduction

This study aims to evaluate of Agri Coll as a bio-organic fertilizer and its effect on yield and yield components of wheat (*Triticum aestivum* L.) and on the content of some elements in both soil and plant. Also, to examine the partial or full substitution of Agri Coll instead of mineral fertilizers. This reduce the risk of contamination and reduce the cost of mineral fertilizer, producing highly quality, safe food and helping in reducing some reasons or problems of climate changes.

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Natural and organic fertilizers are differ from chemicals in that they are building up the soil aggregates and enhancing soil properties.

Soils with high organic matter content contain high moisture and nutrients content, promote the growth of soil organisms and healthy plant. If only chemical fertilizers added, soil will lose gradually its organic matter and the activity of micro biotic. Also, soil structure will deteriorate, becoming compact, lifeless and deficient in water and nutrients. This increasing the amount needed for plant nutrition. (Badgley *et al.*, 2007) accordingly, low availability of nitrogen in organic manure is a major factor contributing to low yields in organic farming.

Low yields and insufficient quantities of biologically acceptable fertilizers considered the main objections to the proposal that organic farming can make a significant contribution to the global food supply. Vermi composting and spraying of innovative fertilizers increase the height of the plants due to the secondary richness of nutrients (N, P, K) and essential micronutrients (Fe, B, Zn and Me) in the plant (Dekhane *et al.*, 2017). Organic and biological fertilizers play a significant role in improving growth, yield and yield components of wheat and decreasing the pollution of environment (Al-Erwy *et al.,* 2016). Humic acid is used as an inexpensive source of organic fertilizer to improve plant growth and yield. Also, to increase stress tolerance, as well as to improve soil physical properties and complex metal ions (Abdel-Razak and El-Sharkawy, 2013). Uses of chemical fertilizers as a only source of fertilizers lead to a deterioration of all soil properties (Khan *et al.,* 2010).

The economic situation of farmers is getting worse due to the lack of affordable price at the time of application of chemical fertilizers. Therefore, other methods are needed to find the best alternative fertilizer sources that are economical. Crop wastes could be applied in conjunction with synthetic fertilizers to satisfy crop nutritional needs and enhance soil fertility (Imad *et al.,* 2022). Yield can be increased by using organic fertilizers by increasing soil organic matter and available nitrogen, phosphorus and potassium and reducing the bulk density of the soil and improving the moisture capacity of the field (Jiang *et al.*, 2006; Zhao and Zhou, 2011) .

There is a need to reduce the use of chemical processes, including chemical fertilizers to produce vegetables with low chemical residues and to prevent environmental pollution. However, the newly reclaimed land in Egypt has low soil fertility and requires high amounts of inorganic fertilizers.

Uses of organic fertilizers reduces the amount of inorganic fertilizer added to the soil (Jerin *et al.*, 2019). Also, uses of organic fertilizers in combination with chemical fertilizers has a high positive effect on microbial activity and therefore on soil health than organic fertilizers (Dutta *et al.*, 2003). It also increased plant absorption of N, P, and K and increased leaf tissue in a sugarcane crop (Bokhtiar and Sakurai, 2005).

2. Materials and methods

2.1. The Experimental design and treatments

A field experiments were carried out in the farm of faculty of agriculture, South Valley University, Qena Governorate, Egypt. Two consecutive seasons in winter 2020 and 2021 to evaluate the effect of Agri Coll as a bio-organic fertilizer on wheat (*Triticum aestivum L.*) yield and its components. The Agri Coll is made from the product of sugar cane industry mixed with some organic farm residues and bio fertilizers). The main specifications of Agri Coll used in current study are presented in table (2). Wheat experiments were carried out during the winter seasons 2020/2021 and 2021/2022, beginning in November as a part of land preparing and irrigation before sowing to control weeds and facilitate land preparation. Applied for a disc-plow was then used, followed by a disc-harrow and read at a distance of 70 cm after levelling. Wheat grains (CV Giza 168) were manually sown at the top of the bund to a depth of 3 cm at a rate of 60 kg/fed and superphosphate (15.5% P_2O_5) was applied at the rate of 100 kg/fed (recommended dose) as basic fertilizer in all plots before sowing. Wheat was harvested in late April in the first and second seasons. The experimental area was divided into 20 plots; each plot size is 1/400 fed (10.5 m^2). The experimental design was random complete block with four replicates. Treatments include two levels of Agri Coll (50 and 100 L/ fed), recommended mineral fertilizer including 100 kg N /fed (urea), 100 kg/fed superphosphate (15.5% P_2O_5) and 48 kg K_2O/ fed (potassium sulfate) and their combinations as shown in Table (2). The applied treatments of mineral fertilizers (nitrogen, phosphorus and potassium) and Agri Coll fertilizers are divided into three equal doses. First dose was applied 21 days after sowing, second dose (45 days after sowing) and third dose 70 days after sowing. Agri coll was added with the irrigation water, whereas urea and potassium sulfate were added side dressing.

2.2. Growth and yield measurements

2.2.1. Plant growth, grain yield and analysis

Samples of wheat vegetable plants were taken for analysis 75 days after planting and pruning. Freshly plant samples were weighed, and then rinsed with tap water, distilled water, air-dried, oven- dried 70° C and then stored for chemical analysis. During harvesting, one square meter of fiber was taken from each plot. Some measurements such as plant height, spike length, number of spikes/m^2 and grain yield /fed were recorded. Wheat germ and grain samples were taken for chemical analysis. Ground shoot and grain samples (0.5 g) were used for wet digestion using a mixture of sulfuric acid and hydrogen peroxide (Parkinson and Allen, 1975). The total potassium in plant digests is determined by the flame photometer (Jackson, 1973).

2.2.2. Soil analysis

Representative soil samples (0-30 cm) from different experimental sites and were air-dried, crushed to pass through a 2 mm sieve and prepared for analysis. Texture was determined by using the pipette method (Piper, 1950); Electrical conductivity ($EC_{1:1}$) is determined using an EC meter; Soil $pH_{(1:1)}$ is measured using a glass electrode; Organic material content is measured by the revised Walkley & Black method; Calcium and magnesium were titrated by the versenate method, while sodium and potassium were measured by a flame photometer. The available phosphorus is extracted according to the Olsen method and measured colorimetric using stannous chloride method (Olsen *et al.*, 1954). Available potassium pH is extracted by the ammonium acetate method at 7.00 and measured by flame photometry (Jackson, 1973). Total nitrogen was determined using the micro-Kjeldahl method (Page *et al.*, 1982).

2.2.3. Statistical Analysis

All data obtained are subject to appropriate statistical analysis of variation according to the MSTAT computer program. According to (Steele and Torrey, 1960) the differences between different treatment modalities were compared using the least significant difference (LSD).

Table 1. Chemical properties of the soil before planting

Parameters	Characteristic		
Particle size distribution	Sand %	Clay %	Silt %
	52.1	12.1	35.8
Texture grade	Sandy loam		
Organic matter %	1.24		
pH (soil water suspensions $_{1:1}$)	7.91		
EC (soil water extract $_{1:1}$) dSm^{-1}	1.89		
Total nitrogen %	0.31		
Available P ($NaHCO^{-3}$ P) ppm	10.64		
Available K (NH_4OAC-K) ppm	347.11		
Available Micronutrients (DTPA, pH 7.3)			
Fe (ppm)	8.99		
Zn (ppm)	1.07		
Cu (ppm)	2.98		
Mn (ppm)	19.03		

Table 2. Chemical analysis of Agri coll

Properties	Value
pH	5.2
Organic matter, %	50
Total N %	10
Total P % P_2O_5	15
Total K % K_2O	30
Fe (ppm)	200
Mn (ppm)	150
Zn (ppm)	100
Cu (ppm)	20

Table 3. Treatments which applied to wheat.

Treatment	Application rates
Control (recommended dose of mineral fertilizer)	100 kg N + 100 Kg P_2O_5 + 48 kg of K_2O /fed
Agri coll 1	50 liter of Agri coll /fed
Agri coll 2	100 liter of Agri coll /fed
Agri coll 1+ Recommended dose of mineral fertilizer	50 liter of Agri coll + Recommended dose of mineral fertilizer
Agri coll 2+ Recommended dose of mineral fertilizer	100 liter of Agri coll + Recommended dose of mineral fertilizer

3. Results

3.1. Effect of bio-organic fertilizer (Agri coll) and recommended dose of mineral fertilizers applications on the soil chemical properties

3.1.1. Soil pH

The results as shown in (Figure 1) revealed that addition of Agri coll alone or with recommended dose of mineral fertilizers at both level (50 L / fed and 100 liters /fed) significantly reduced the soil pH in both seasons. However, the reduction effect was more pronounced in the second season (Figure 1). Soil pH reduced from 7.93 and 7.91 in the first and second seasons to 7.88 and 7. 80 with the application of 100 L / fed Agri coll with or without mineral fertilizers, respectively.

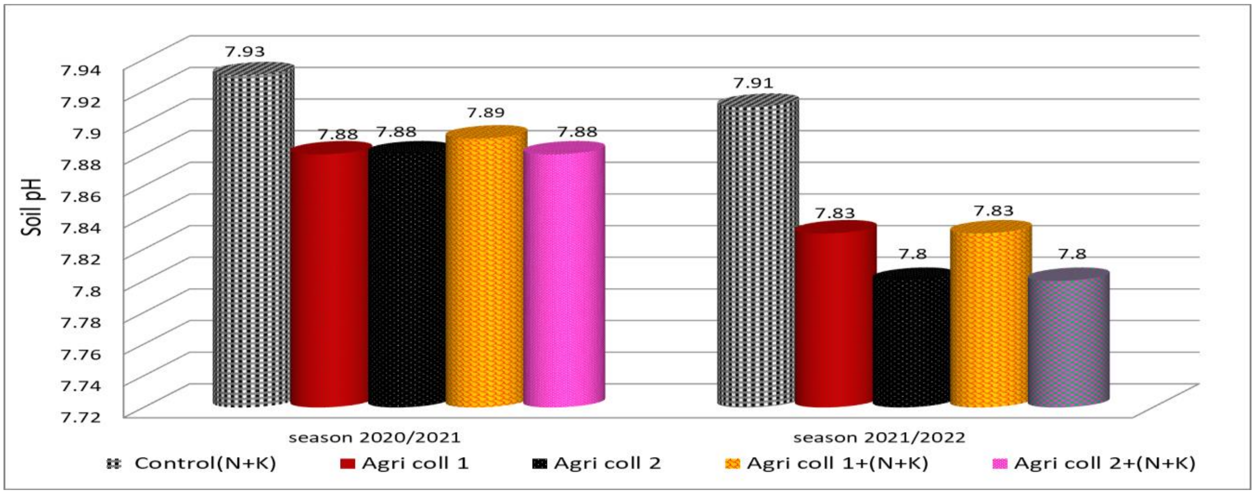

Figure 1. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on soil pH during 2020/2021 and 2021/2022 seasons.

3.1.2. Soil salinity

EC changed according to the applications of bio-organic and chemical fertilizer are given in (Figure 2). Data show that although these increases were negligible, the control plots showed an increase in EC values compared to the base soil EC 1.82 dS m^{-1}. Also, the application of 100 L / fed Agri coll + mineral fertilizers always recorded the highest EC values (1.89 and 1.90 dSm^{-1}) in 2020 and 2021, respectively.

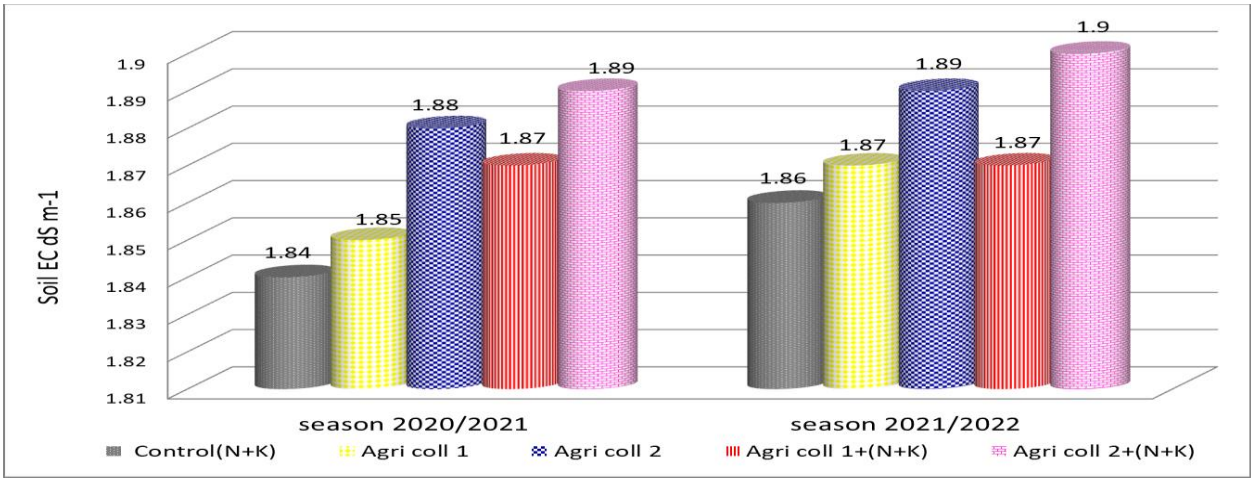

Figure 2. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on soil EC during 2020/2021 and 2021/2022 seasons.

3.1.3. Soil available P

Results showed that available soil phosphorus with application of Agri coll alone or in combination with the recommended mineral fertilizers slightly increased soil phosphorus (Figure 3). Soil P availability increased from 10.74 to 11.33 and 11.69 ppm with 50 and 100 L Agri coll and from 11.16 to 11.41 and 11.76 ppm with 50 and 100 L during the 2020/2021 and 2021/2022 seasons, respectively. Soil available P increased from 10.74 to 11.43 and 11.76 ppm with 50 and 100 L/ Agri coll + recommended mineral fertilizer application during the 2020/2021 season, and from 11.16 to 11.48 and 11.82 ppm in the 2021/2022 season, respectively.

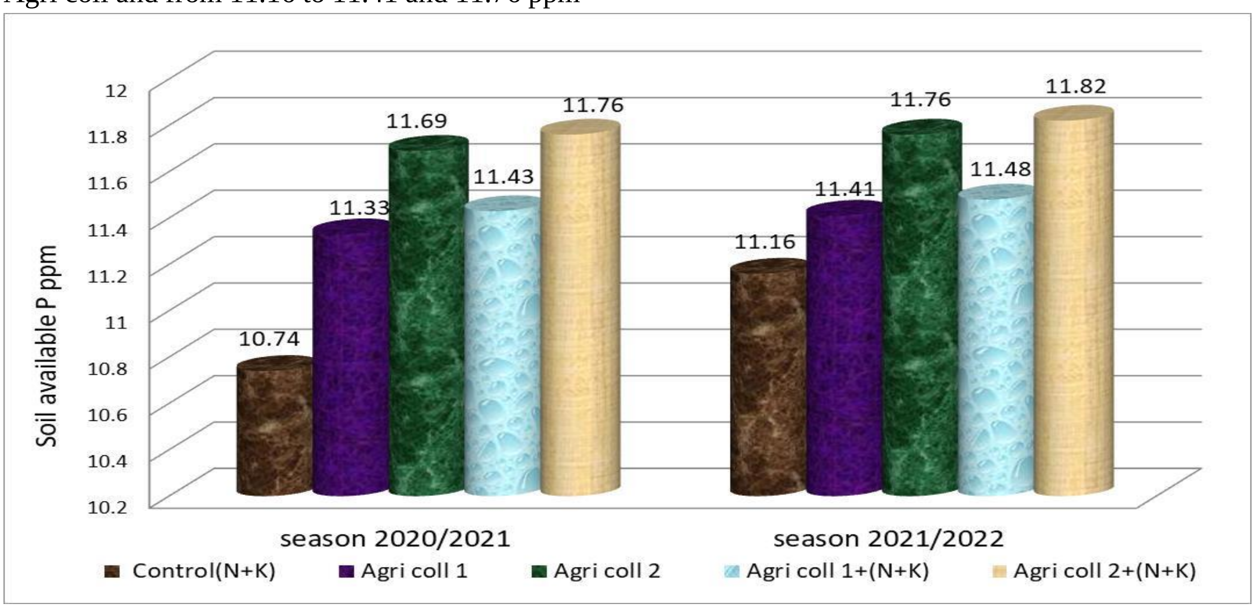

Figure 3. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on soil available P during 2020/2021 and 2021/2022 seasons.

3.1.4. Soluble and exchangeable potassium

The solo application of Agri coll or combined with the recommended mineral fertilizers, in both season, caused significant increases in the soluble and exchangeable potassium as compared with the control (Figure 4,5). Soluble K was increased from 17.55 and 17.94 ppm in the control treatment to 28.47 and 24.57 ppm with 100 L Agri coll plus mineral fertilizers in 2020 and 2021, respectively. When the soils received 50 and 100 L/fed of Agri coll the exchangeable K was significantly increased by 9.57 and 29.32%, respectively, for season 2020/2021 and 13.64 and 33.57%, respectively, for season 2021/2022 as compared with the control. The application of 100 L Agri coll plus mineral fertilizers had the highest significant effect on exchangeable K content in both seasons.

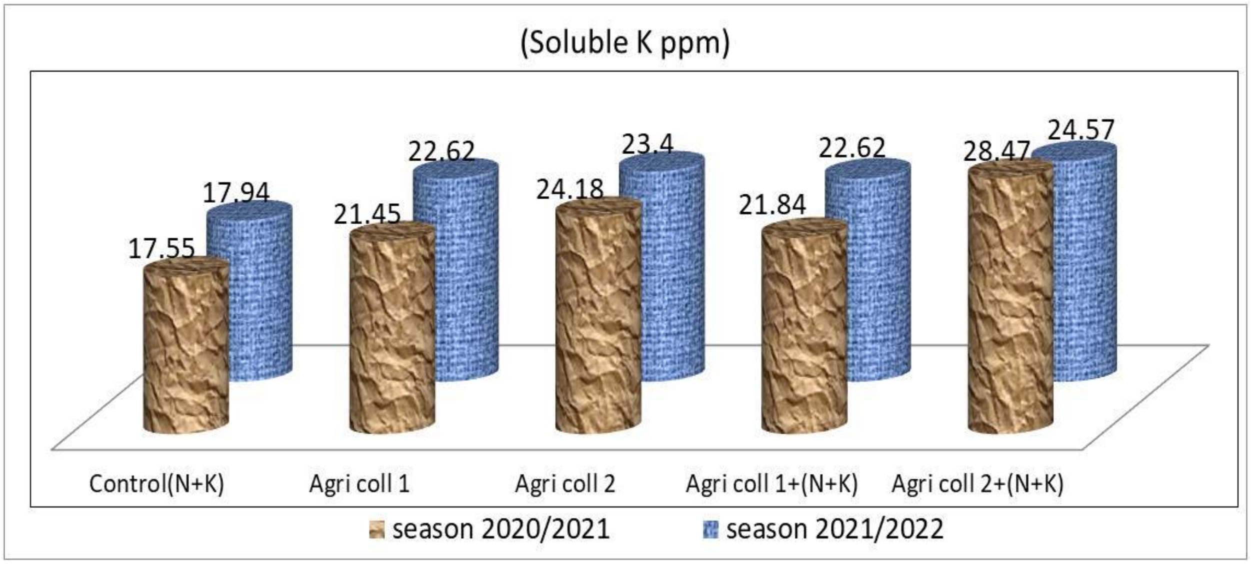

Figure 4. Effect of bio-organic application and recommended dose of mineral fertilizers applications on soluble potassium during 2020/2021 and 2021/2022 seasons.

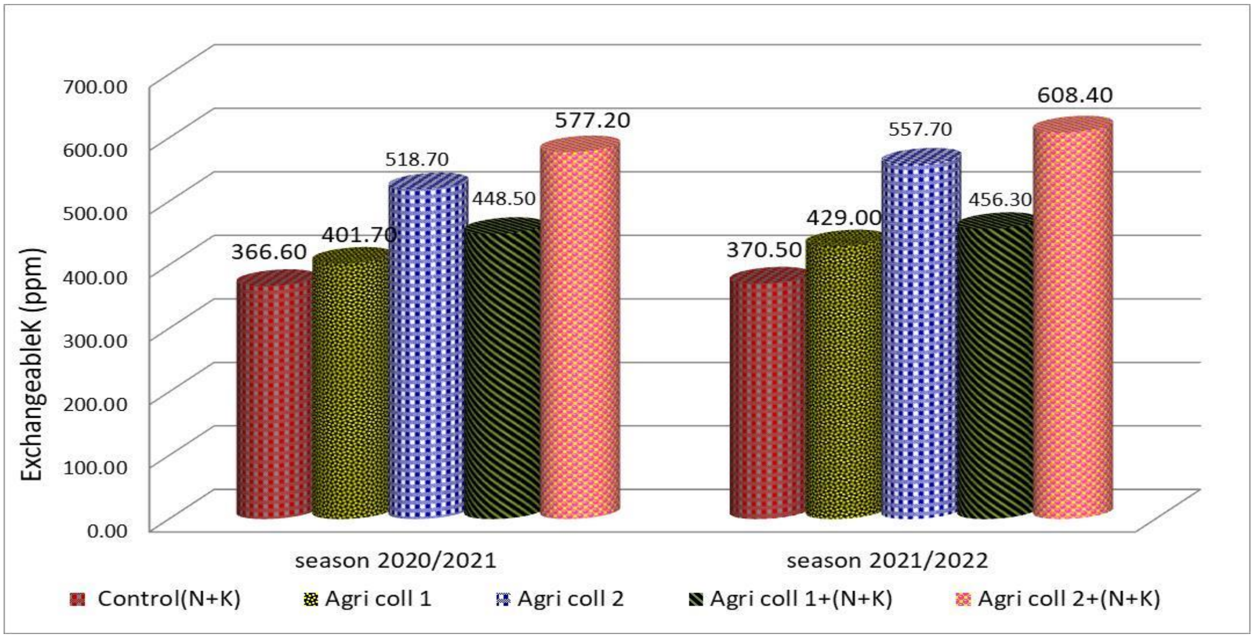

Figure 5. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on exchangeable potassium during 2020/2021 and 2021/2022 seasons.

3.1.5. Micronutrients

Availability of Fe, Zn, Cu and Mn were affected by the use of Agri coll and/or recommended mineral fertilizers (Figure 6).The results showed that there was a significant increase in the available Cu and Mn in the soil over the control supplying with Agri coll and / or mineral fertilizer but did not reached to significant level in case of Fe and Zn.

During the 2020/2021 season, the available micronutrients in the soil increased from 9.68 to 9.71 and 9.86 ppm for Fe, from 1.07 to 1.11 and 1.12 ppm for Zn, from 3.03 to 3.27 and 3.50 ppm for Cu and from 19.20 to 19.65 and 20.22 ppm for Mn using 50 and 100 L/ fed of Agri coll, respectively.

It was found that increasing the application level of Agri coll alone or in combing with recommendation mineral fertilizer increased the concentration of available micronutrients in soil .

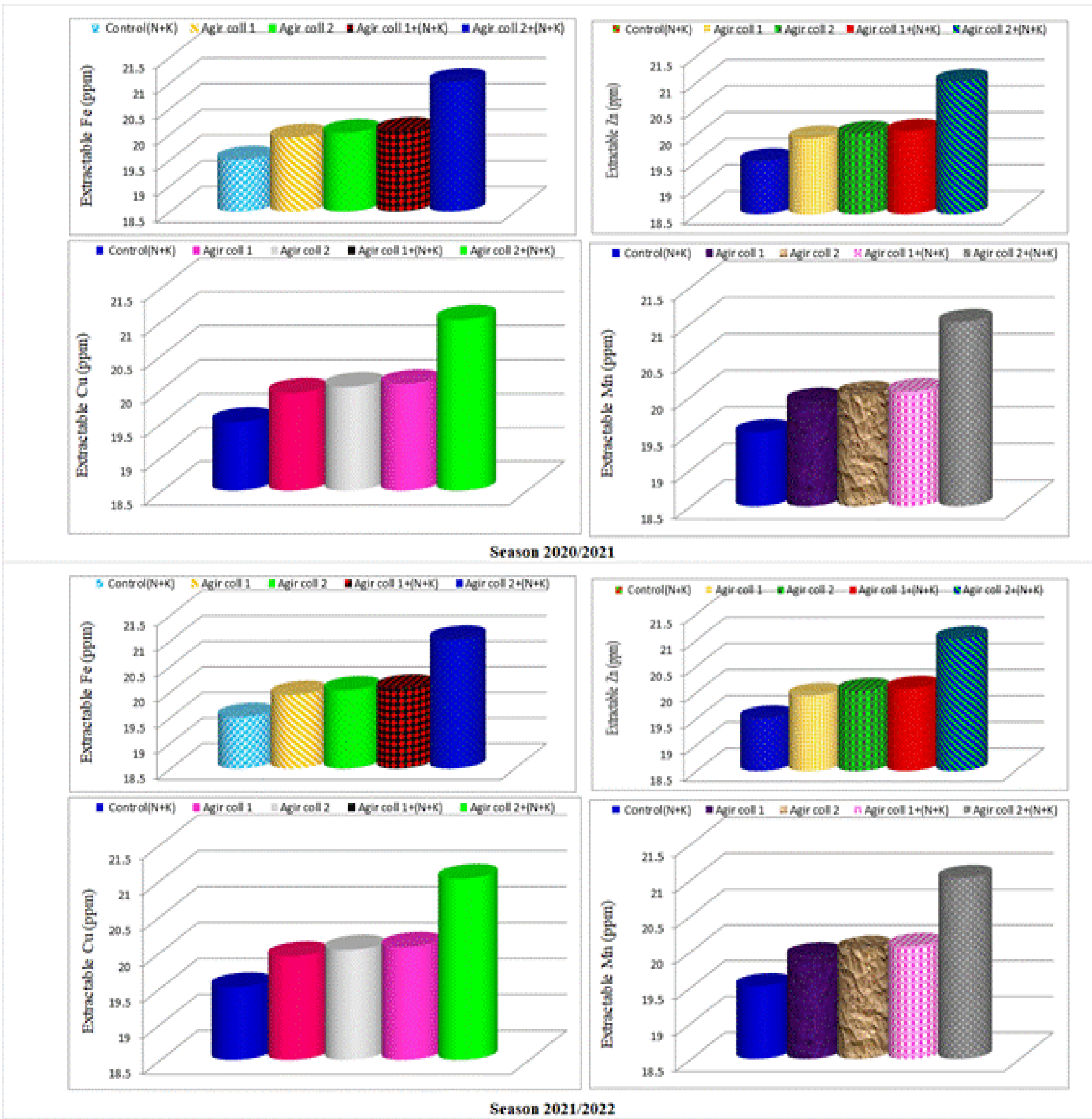

Figure 6. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on extractable micronutrients during 2020/2021 and 2021/2022 seasons.

3.2. *Effect of bio-organic fertilizer and recommended dose of mineral fertilizers applications on nutrient content of wheat plants*

3.2.1. Potassium content

During the 2020/2021 season, all treatments showed a significant increase in potassium content of shoots and wheat grains compared to the control (Figure 7,8). The use of 50 and 100L/ fed significantly increased K content by 1.29 and 5.16 % in shoots and 1.40 and 6.15% in grains over the control, respectively. The highest increase occurred when high levels of Agri coll (100 L /fed) were added with the recommended mineral fertilizer which reached to (5.26% and 8.10% in shoots and grains over the control, respectively). However, in the 2021/2022 season, K in shoots was increased by 1.28 and 7.68% and by 0.82% and 1.37% in grains with 50 and 100 L Agri coll + mineral fertilizers over the control, respectively.

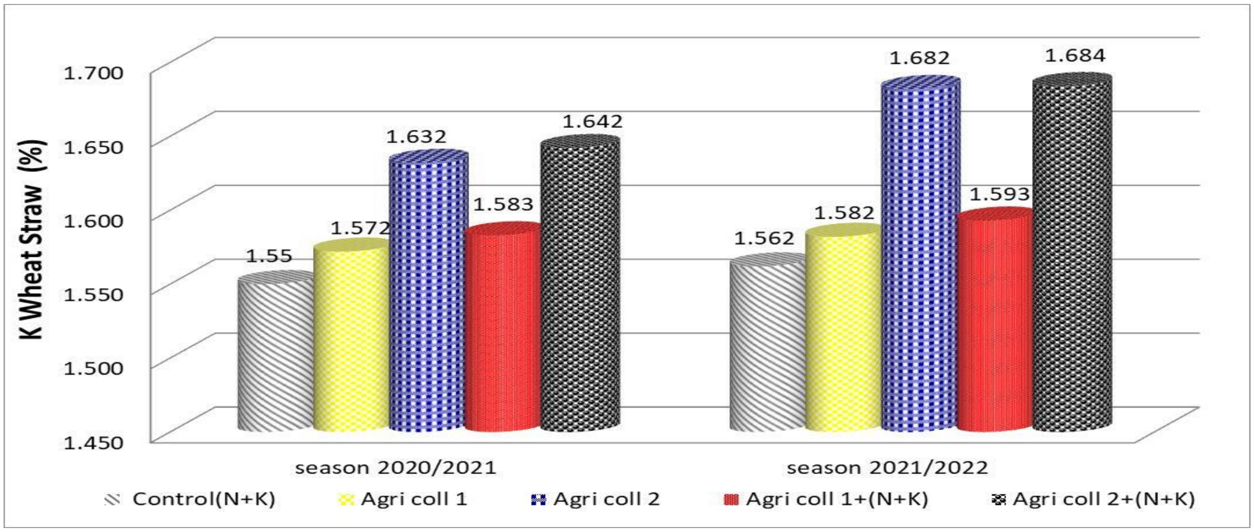

Figure 7. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on Potassium content of wheat straw during 2020/2021 and 2021/2022 seasons.

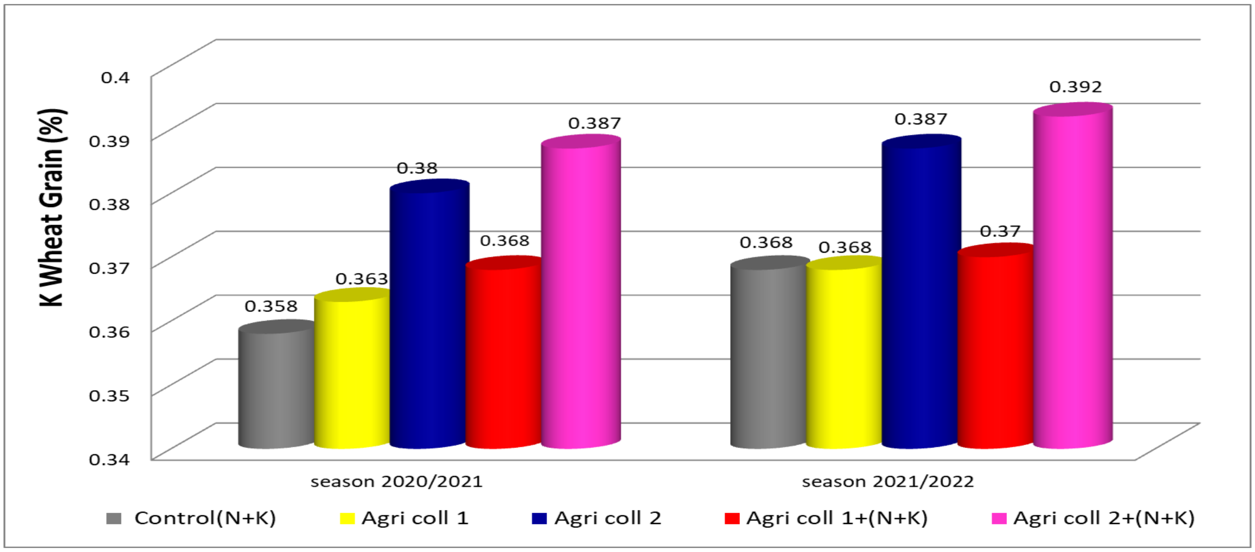

Figure 8. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on Potassium content of wheat grain during 2020/2021 and 2021/2022 seasons.

3.2.2. Phosphorus content

Figures (9 , 10) illustrates the phosphorus content in wheat shoots and grains. All treatments significantly increased phosphorus content in shoots and grains of wheat grown in the both seasons. The highest increases were found with the application of high level of Agri coll (100L /fed) with and without menial fertilizers. In season 2020/2021 the increases of P in shoots were by 12.57 and 17.14% and in grain by 16.28 and 18.60 %, respectively. Whereas, in season 2021/2022 P in shoots increased by 12.02 and 21.86% and by 13.00 and 15.25% over the control, respectively.

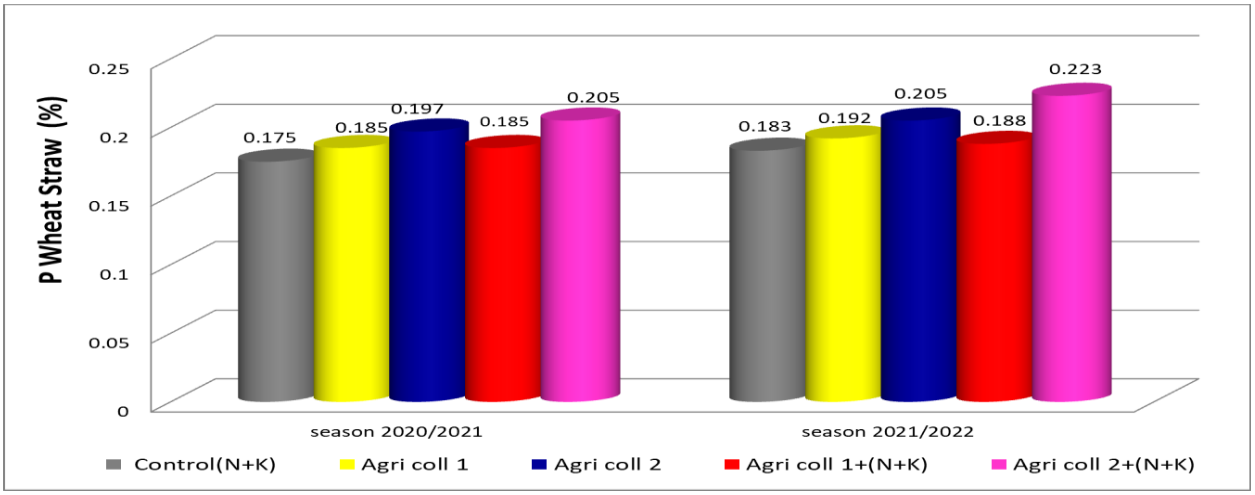

Figure 9. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on Phosphorus content of wheat straw during 2020/2021 and 2021/2022 seasons.

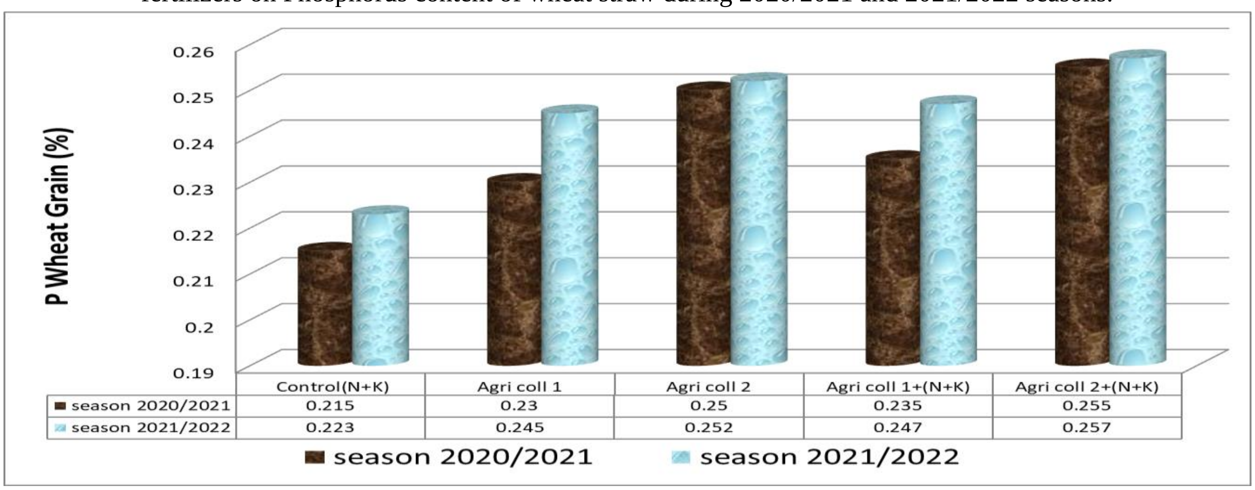

Figure 10. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on Phosphorus content of wheat grain during 2020/2021 and 2021/2022 seasons.

3.2.3. Micronutrients content

Table (4) shows that, application of 50 and 100 L/fed of Agri coll with or without recommended mineral fertilizer caused a significant increase of micro elements in the shoots and grains of wheat in both seasons. The highest significant increase was found with the application of Agri coll2 plus recommended dose of mineral fertilizer. In the season 2020/2021, the content of Fe, Zn, Cu and Mn in shoots increased from 300.21 to 384.50 ppm, from 17.72 to 24.58 ppm, from 9.05to 13.20 ppm and from 20.01to 31.81 ppm, respectively. However, they increased from 91.98 to 158.49 ppm, from 58.48 to 78.25 ppm, from 7.44 to 12.81 ppm, and from 22.41 to 27.87 ppm in the grains, respectively.

Table 4. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on micronutrients content (ppm) on wheat straw and grain during 2020/2021 and 2021/2022 seasons.

Treatment	Wheat 2020/2021								Wheat 2021/2022							
	Straw				Grain				Shoot				Grain			
	Fe	Zn	Cu	Mn	Fe	Zn	Cu	Mn	Fe	Zn	Cu	Mn	Fe	Zn	Cu	Mn
Control(N+K)	300.21	17.72	9.05	20.01	91.98	58.48	7.44	22.41	315.18	18.09	9.53	24.99	93.14	60.38	8.34	23.19
Agri coll 1	359.05	19.53	10.40	26.08	131.96	68.57	9.65	24.91	364.83	21.01	10.83	28.50	133.49	69.04	10.06	25.16
Agri coll 2	381.12	22.56	12.95	30.49	155.10	76.97	12.35	26.18	381.12	24.36	13.34	33.87	156.56	77.60	12.88	27.06
Agri coll 1+(N+K)	360.86	20.59	10.51	26.91	133.90	69.29	10.54	25.84	370.86	22.14	11.37	29.47	135.46	70.09	11.10	26.09
Agri coll 2+(N+K)	384.50	24.58	13.20	31.81	158.49	78.25	12.81	27.87	388.00	25.08	14.21	34.59	159.50	79.25	13.42	28.19
$L.S.D_{0.05}$	8.77	1.34	0.57	3.39	4.37	1.42	0.50	1.13	15.77	1.68	0.82	1.75	5.21	1.04	1.01	0.91

100 kg N /fed +100 Kg/fed P_2O_5+ 48 kg/fed of K_2O, Agri coll1=50 liter/fed and Agri coll 2=100 liter/fed

Table 5. Effect of bio-organic fertilizer application alone or in combination with recommended dose of mineral fertilizers on growth and grain yield of wheat.

Treatment	Dry matter weight (g)		Plant height (cm)		Spikes length (cm)		Number of spikes/m^2		Grain yield ton/fed	
	2020/2021	2021/2022	2020/2021	2021/2022	2020/2021	2021/2022	2020/2021	2021/2022	2020/2021	2021/2022
Control	75.26	76.38	125.12	125.25	11.00	11.55	383.25	378.25	2.53	2.60
Agri coll 1	79.60	81.55	126.35	126.45	13.00	12.75	409.50	404.24	2.73	2.86
Agri coll 2	83.74	83.84	127.43	127.35	13.50	13.65	421.00	419.25	2.99	3.01
Agri coll 1+mineral fertilizer	81.20	81.56	126.75	126.55	13.25	13.00	409.75	406.00	2.86	2.91
Agri coll 2+ mineral fertilizer	84.68	84.88	127.54	127.58	13.50	13.81	429.00	424.25	3.05	3.17
$L.S.D_{0.05}$	4.38	4.38	1.06	1.01	1.26	1.16	21.36	21.11	0.16	0.15

100 kg N /fed +100 Kg/fed P_2O_5+ 48 kg/fed of K_2O, Agri coll 1=50 liter/fed and Agri coll 2=100 liter/fed.

These increases were by 28.07, 38.71, 45.86 and 58.97% for shoots and by 72.31, 33,81, 72.18 and 24.36% for grain, respectively. While, in season 2021/2022, the results showed the same trend that obtained in the first season.

3.3. Effect of bio-organic fertilizer (Agri coll) application and recommended dose of mineral fertilizers applications on the growth and grain yield of wheat

Effect of application of Agri coll and mineral fertilizers on the growth parameters and grain yield of wheat is shown in Table (5). The use of 50 and 100 L/ fed of Agri coll significantly increased plant growth parameters and yields in both seasons, number of spikes per m^2, spike length, plant height, dry matter weight and grain yield (ton/fed). During the 2020/2021 season, wheat grain yields increased by 7.33 and 15.38%, respectively. However, during the 2021/2022 season, grain yields increased by 9.09 and 15.77%, respectively, compared to the control. The highest recorded data in seasons 2021 and 2022 was always found with Agri coll 2 plus recommended dose of mineral fertilizer which recorded 127.54 and 127.58 cm for plant height, 84.68 and 84.88 g for dry matter weight, 13.50 and 13.81 cm for spike length, 429 and 424.25 for number of spikes /m^2 and 3.05 and 3.17 tons for grain yield, respectively.

Generally, the positive effects of the treatments on increasing all discussed parameters can be arranged as follow: Agri coll 2 plus recommended dose of mineral fertilizer > Agri coll 2 > Agri coll 1+ plus recommended dose of mineral fertilizer > Agri coll 1.

4. Discussion

Applications of Agri coll resulted in significant soil pH reductions. The soil buffering capacity seems to overcome the changes in the soil pH from year to year, since the pH values were very close to those of season 2021/2022. Addition of compost for 12 consecutive growing season decreasing soil acidity and improve soil fertility (Chen *et al.*, 2022). Organic carbon is a part of organic matter play a role as a source of energy when it mineralized for soil microorganisms that release organic acids that cause soil pH to decrease.

A decrease in soil pH was observed which affected on many soil properties and the application of organic modifications (Chris and Sola, 2010), this due to the effect of palm oil mill effluent (POME). According to them, pH decreases due to the nitrification activity of NH_4-N components in biological changes. Similar results have been noticed in treated soils with palm oil mill waste under lab conditions by (Pascual *et al.*, 2007) as well as by (Cereti *et al.*, 2004) in soil treated with mill waste water under wheat crop cultivation. Generally, phosphorus content in the soil slightly increased comparing with the control and this may be due to the effect of annually recommended levels of phosphorus that are applied pre cultivation, and because Agri coll contains moderate amounts of phosphorus.

Existing P was high level under fertilizer treatments; this due to the releasing of organic acids during the decomposition of organic matter which causes lower in pH value and release P from stable complexes or chelates, thereby increasing P availability. These results show that addition of organic fertilizers alone and/or in combination with plus recommended dose of mineral fertilizer have a great effect on increasing the P and K availability in the soil. Organic fertilizer application significantly reduced the fixation of added and natural P, increasing P availability on the plant (Son and Ramaswami, 1997).

The highest increase occurred when the high level of Agri coll (100 L/fed) was mixed with the recommended dose of mineral fertilizer. Similar results found that organic fertilizers had a significant affected on soil exchangeable potassium and magnesium (Mohamed *et al.*, 2007).

Also (Chauhan, 2001) reported that a positive co-relationship between organic matter and available potassium and that with increasing in organic matter tends to increasing in the accumulation of available potassium in soil. Possible explanations for the increases in soil available micronutrients with Agri coll application are: (i) Its high content of these nutrients, (ii) Formation of soluble micronutrient elements-organic associations and (iii) The decrease in soil pH. This may explain the effect of Agri coll on increasing these elements availability in soil and hence improving soil fertility. These results matched the finding of (Abd El Razek *et al.,* 1984) who reported the DTPA-extractable Mn ranged from 0.47 to 53.6 ppm in Qena Governorate soils. (Zeid *et al.,* 2015) found that, chicken manure compared with other treatments caused an increase in availability of some soil nutrients such as Fe, Mn and Zn.

The increase K content in shoots and wheat grains with uses of Agri coll was more than the increase with the use of inorganic fertilizers.

Shoot content of Potassium also influenced significantly with organic manures application and mineral fertilizers alone. Highest K uptake of 13.4 kg ha^{-1} (8% over control) was recorded with the farmyard manure application and uses of various organic and mineral fertilizers has resulted in increased nitrogen, phosphours and potassium% and Fe content in leaves and tubers except Cu and Mn as stated by (Phullan *et al.,* 2017). Applications of Agri coll to the soil add substantial amounts of macro and micronutrients to the soil. (Zeid *et al.,* 2015*)* found that, application of chicken manure increased the values of trace elements (5.63, 2.87, 7.23 and 2.32 mg kg^{-1} for Fe, Cu, Mn and Zn, respectively) which was attributed to the initially high content of chicken manure from total trace elements .

Applications of Agri coll and/or mineral fertilizer increased the yield of wheat. The increases caused by application of Agri coll were higher than those of recommended of mineral fertilizer. The highest increase was found for Agri coll 100 L / fed + recommended dose of mineral fertilizer treatment. The combination of Agri coll and mineral fertilizer gave maximum productive tillers in both season. The performance of the above combination was better in all the crop growth stages as there was frequent availability of nutrients for planting in all the growth stages. (Tufail *et al.,* 2014) reported that, addidtion of humic acide at the rate of 12.5 kg HA/ha increased spike length, number of spikelet's per spike and 100 grain weight of wheat crop. Similarly, (Haghighi *et al.,* 2014) reported that the application of 7.0 L of humic acid/ha had effected significantly on spike length, 1000 grain weight and crop index. On the other hand, (Seleiman *et al.,* 2021) found that Application of organic fertilizer in a combination with 50% mineral N had positive effects on yield and quality of wheat. In addition, (Khaled and Fawy, 2011) reported an increase in nutrient uptake by soil or foliar humic acid, and get better growth of maize plants in saline soil.

5. Conclusion

Results indicate that Agri coll has promising potential as a good source of minerals and organic fertilizers and as a partial or complete alternative to mineral fertilizers required for optimum crop yield could work. The growth parameters, yield and concentrations of certain macro and micronutrients in some crops like wheat, it is better to apply Agri coll in both season to get high yield and to keep the environment clean.

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All authors are contributed in this research.

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All Institutional Review Board Statements are confirmed and approved.

Data Availability Statement

Data presented in this study are available on fair request from the respective author.

Ethics Approval and Consent to Participate

Not applicable

Consent for Publication

Not applicable.

Conflicts of Interest

The authors disclosed no conflict of interest starting from the conduct of the study, data analysis, and writing until the publication of this research work.

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