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Influence of Different Types and Amounts of Organic Manure on Soil Physical Properties, Wheat (*Triticum aestivum* L.) Yield and Correlation between Traits

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ABSTRACT

Manure not only supplies many nutrients for crop production, but it is also a valuable source for increasing soil organic matter content and improving soil structure. To increase organic manure content as well as improve the wheat production adding plant residues and livestock to soil is necessary. The experiment was conducted in Shavoor Research Station to determine seed yield and soil physical characteristics under different amounts and sources of organic manure through combined split plot experiment based on randomized complete blocks design with three replications for a duration of five mentioned years. Main plots included seven types of organic manure (cattle and hen manures, sugarcane filter cack and bagasse, wheat straw and green manure which were compared with control) and three amounts of manure (2.5, 5 and 10 $t.ha^{-1}$) witch belong to sub plots. Result of analysis of variance indicated the effect of different types of organic manure on seed yield, 1000-seed weight, number of spike per square meter, spike length, plant height, bulk density and infiltration rate was significant. Also the effect of year and different amounts of organic manure on all measured traits instead bulk density, infiltration rate and number of spike per square meter was significant. Wheat straw plays a major role in improving the physical properties of the soil. Sugarcane filter cack, sugarcane bagasse and cattle manure (at least 2.5 $t.ha^{-1}$ for four years or more) had a positive effect of increasing wheat yield, seed weight, number of spike per square meter, spike length and plant height.

Keywords: *Agronomic traits, Crop residue, Infiltration rate.*

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INTRODUCTION

The knowledge of the physical properties of soil is essential for defining and/or improving the soil health to achieve optimal productivity for each soil/climatic condition. The physical characterization of soil in the field depends strongly on its spatial and temporal variability. There is a strong growing realization that yields are limited by the physical conditions rather than plant nutrient status in the soil (Indoria *et al*., 2016). Wheat is the national staple food in forty-three countries. According to the statistics of the Food and Agriculture Organization (FAO), during 2013-2014 growing season, 690 million tons of wheat were produced and it is estimated that up to 698 million tons will be produced in 2016- 2017 growing season. The experts contend that the amount of the annual wheat production must be 2% higher than the annual demand. The world does not have enough potential for increasing the soil level cultivated with wheat; therefore in order to increase the wheat production, we have to increase the productivity of the fields which have been cultivated with wheat (FAO, 2017). There is a need to increase the yield of wheat per unit area in the world to fulfill its demands as a result in the rapid growth of the world's population. The use of modern varieties of wheat and judicious fertilization are the important factors which can help the increase of wheat production. It is well recognized that crop productivity depends on adequate plant nutrient and organic matter content of the soil (Mehraban, 2013). Manure plays an important role in improving physical, chemical and biological properties of the soil. Manures contain a low concentration of plant nutrients and they have a slow acting nature, organic manure alone may fail to tend the high nutritional requirements of crops (Hossian *et al*., 2002). Continuous addition of manures to the soil increase its organic matter content year after year, improving physical and chemical soil properties (Bohme and Bohme, 2006). Surface management and crop residue management practices alter the pattern of water entry into the soil. Improvement of soil situation involves providing a suitable soil structure, increasing soil cation exchange capacity, increasing the quantity and availability of plant nutrients in addition to furnishing the microbial activities (Sikora and Azad, 1993). The application of farmyard manure to soil has been practiced for many centuries, and its application to soil have increased crop yield, improved soil fertility, increased soil organic matter, increased microbiological activities and improved soil structure for sustainable agriculture for further years (Blair *et al*., 2005; Kundu *et al*., 2006). Organic manures including sheep manure, cattle manure and hen manure may be used for crop production as substitute of chemical fertilizers because the importance of organic manures cannot be overlooked (Abbas *et al*., 2012). Using manure in wheat production through cropland is an alternative method to reduce feedlot environmental impact (EPA, 2001) and thus to achieve an integrated farming system (Gupta *et al*., 2012). The prolonged and over usage of chemicals has however, resulted in human and soil health hazards along with environmental pollution. Farmers in the developed countries are therefore, being encouraged to convert their existing farms into organic farm (Yadav *et al*., 2013). Organic materials act as chelating agents and hold the minerals desorbed from the soil. During the decomposition of organic matter, acids are also produced which increase the availability of mineral nutrients in the soil for plants

(Lorenz and Maynard, 1980). Cheraghi *et al*. (2016) studied the effect of organic manure and phosphorus fertilizer on yield and yield components of bread wheat and reported that the combined application of organic manure or vermicompot with chemical fertilizer has a better effect on yield and yield components of common wheat rather than single application. On the other hand combined application of organic and chemical fertilizers had more efficiency due to some positive interaction between their microorganisms in the soil that led to a synergistic effect and therefore lead to an increase in seed yield. Lotfi Jala-Abadi (2012) evaluated the different fertility systems associated with wheat cultivars production and reported that wheat yield and its component can be raised significantly by modifying agronomic practices. Yields were increased, by application of animal manure and bio-fertilizer, as well as application of inorganic nutrients. The integrated use of animal manure and bio-fertilizer performed better than the use of inorganic fertilizer or animal manure alone. Most southwestern lands of Iran, especially Khuzestan province, are poor in organic matter, hence their organic carbon content is less than 1%; therefore, increasing the amount of organic matter is necessary. One of the possible ways to overcome this problem is gradual, but continuous addition of organic fertilizers from available resources in the province. This study was conducted to evaluate the effect of different sources and amounts of organic manure on wheat yield and improvement of soil physical properties.

MATERIALS AND METHODS

Field and treatments information

The experiment was carried out in Shavoor Research Station to determine seed yield and soil physical characteristics under different amounts and sources of organic manure via combined split plot experiment based on randomized complete blocks design with three replications in a duration of five years (1998-2003). The main factors included seven types of organic manure (cattle and hen manures, sugarcane filter cack and bagasse, wheat straw and green manure which were compared with control; without using any organic manure) and three amounts of manure (2.5, 5 and 10 $t.ha^{-1}$) which belonged to the sub factor. Research field was located in 70 km North of Ahvaz at longitude 48 27′E and latitude 31 50' N in Khuzestan province (South west of Iran). The altitude, average annual rainfall, temperature, and evaporation in the region are 32m, 240 mm, 22 C and 3000 mm, respectively. Soil characteristic are presented in Table 1. Wheat cultivar used in this research was Chamran. Area of each sub plots was 18 square meters, distance between sub plots, main plot and replication was 1, 2 and 5 m, respectively.

Table 1. Soil properties of studied field

Depth (cm)	ECe ($ds.m^{-1}$)	pH	O.C (%)	Soil texture	P (ppm)	K (ppm)	Fe (ppm)	Cu (ppm)	Mn (ppm)	Zn (ppm)
0-30	3.55	7.5	0.58	Clay Loam	10.77	249	9.4	1.2	8.4	0.5

Farm management

Fertilizers were added to the soil based on soil tests and the recommendations of the Iranian Soil and Water Research Institute at the planting stage (instead nitrogen element). Urea fertilizer was used at 250 $kg.ha^{-1}$ (half at planting stage and the rest was applied at stem elongation). Also triple super phosphate (100 kg.ha^{-1}) and zinc sulfate (25 kg.ha^{-1}) were used. In order to accelerate the decomposition of organic manure, per every ton of manure, 30 kg.ha^{-1} of urea was used simultaneously with the mixing of manure with soil. Weeds were controlled through topic (0.8 L.ha^{-1}) and granestar (15 gr.ha^{-1}) herbicides at the beginning of tillering stage. Irrigation was done after planting the seeds and the first irrigation was considered as the planting date while the rest irrigations were done as required and based on rainfall in plots. Table 2 shows five year average of chemical analysis of different types of organic manure.

Table 2. Result of analysis samples of organic manure

Samples description	C/N	Moisture (%)	Dry matter (%)	N (%)	O.C (%)	P (ppm)	K (ppm)	Fe (ppm)	Cu (ppm)	Mn (ppm)
Wheat straw	65	9	91	0.74	48	887	1.74	872	14.4	62
Hen manures	14	7	93	2.72	38	6040	1.0	5374	30.5	300
Cattle manures	21	6.8	93.2	1.47	31	8096	2.97	7092	31.5	416
Sugarcane bagasse	32.5	44	56	1.59	52	368	0.17	408	4.3	24
Sugarcane filter cack	49.5	54	46	0.99	49	11102	0.28	4400	58.0	54

Traits measure

In order to determine the yield and yield components, after eliminating the marginal effects samples were taken from an area of 1m^2. In order to determine the number of spikes per unit area, the spikes were taken from an area of 1 m^2 and their mean was considered as the number of spikes per unit area. Two 500 seed samples were randomly selected by each plot and if the weight difference of the two samples was less than 5%, the total weight of the two samples was considered as weight of 1000-seed. After full maturity of the seeds, the spikes were taken from the 3 middle lines of each plot in an area of 1m^2 and the seed yield of each plot with moisture of 14% was calculated per unit area. The rate of water infiltration in the soil was calculated with using the Kostiakov (1932) model:

Eq. 1. $I= b/1-a \times t^{(1-a)}$

I= Infiltration rate (cm.hour^{-1}), **t**= time, **a, b**= Experimental coefficients. Therefore, after harvesting a certain volume of soil from different depths of the soil after harvesting, sampling was done from intact soil. So after harvesting of a certain volume of soil from depths, 0-10, 10-20 and 20-30 cm, samples were heated in an oven at 100 °C for 24 hours to calculate the dry weight of the soil. Then, by considering the size of the samples, the bulk density of the soil was measured.

Statistical analysis

Analysis of variance and mean comparisons were done via MSTAT-C software and Duncan multiple range test at 5% probability level. Correlation between measured traits was done with Minitab software (Ver.14).

RESULTS AND DISCUSSION

Seed yield

Result of analysis of variance indicated that the effect of year, different sources and amounts of organic manure on seed yield was significant at 1% probability level, but interaction effect of treatments was not significant (Table 3). Table 4 shows that in the total of 5 years, the 4th and 5th years of experiment, had the best results in seed yield and had a significant difference with the other years, followed by the first, third and second years, respectively. These results indicate that the minimum amount of time required to obtain the desired result from organic manure use (from any source) for increasing wheat yield is 4 consecutive years. Nevertheless, in the following years, there was an expected increase in wheat yield, but it was less. The lowest yield is related to the second and third years, because during these years the activity of the soil microorganisms has already reached its maximum rate (due to the increase of the source of food) and given that the level of nutrient storage has not yet reached the level to feed them, the existing soil storage was consumed and this led to decrease in yield. In the first year, due to the fact that the microbial activity of the soil has not yet reached its optimum level, organic manure as a source of nutrition led to an increase in wheat yield. Results of mean comparison showed in different amounts of organic manure, the minimum seed yield (4297 $kg.ha^{-1}$) was observed in 10 $t.ha^{-1}$ and the highest one (4411 $kg.ha^{-1}$) was found in 2.5 $t.ha^{-1}$ treatment (Table 5). Also the comparison of different types of organic manure revealed that the highest seed yield (4772 $kg.ha^{-1}$) belonged to sugarcane filter cack treatment, followed by, sugarcane bagasse (4467 $kg.ha^{-1}$) and cattle manure (4452 $kg.ha^{-1}$) treatments. The lowest effect on seed yield belonged to wheat straw (4019 $kg.ha^{-1}$), green manure (4022 $kg.ha^{-1}$), control (4321 $kg.ha^{-1}$) and hen manure (4415 $kg.ha^{-1}$), respectively (Table 6). In wheat straw treatment, yield loss was related to the high ratio of carbon to nitrogen which causes nitrogen loss in the soil due to the intense activity of microorganisms and the high consumption of nitrogen in the soil, and so need more time to decay than other treatments (Prasad and Sinha, 2000). Hen manure treatment in all studied years did not produce optimum yield due to severe lodging plants at grain filing period. As shown in table (2), the highest nitrogen content between organic manures belonged to the hen manure, also, the highest plant height (100.20 cm) and spike height (8.96 cm) are related to that treatment (Table 6), due to the mentioned reason expected for lodging crop. Also, lodging was observed in sugarcane filter cake and cattle manure treatments, especially at levels of 5 and 10 tons per hectare. Mam Rasul *et al*. (2015); Morris *et al*. (2009); Tahir *et al*. (2011); Tayebeh *et al*. (2010) have pointed similar results in this regard.

Seed weight

According to the result of analysis of variance, effect of year, different sources and amounts of organic manure on seed weight was significant at 5% probability level, but interaction effect of treatments was not significant (Table 3). Comparison of different years indicated that the fifth year had the highest amount (38.70 gr) of seed weight and the second year had the lowest one (35.94 gr) (Table 4). Mean comparison result of different amounts of organic manure showed that the maximum and minimum amount of seed weight belonged to 2.5 $t.ha^{-1}$ (37.73 gr) and 10 $t.ha^{-1}$ treatment (37.09 gr) (Table 5), respectively. Among different sources of organic manures, sugarcane filter cack had highest amount (38.67 gr) of seed weight and wheat straw treatment had the lowest one (36.01 gr) (Table 6).

Table 3. Combined analysis of variance of measured traits

S.O.V	Group 1	Group 2	Group 3	Seed yield	Seed weight	Number of spike per square meter	Spike length	Plant height	Bulk density	Infiltration rate
Year	4	3	3	53396.74**	77.15*	20429.98ns	9.037**	102.466**	0.112*	7.185*
Replication*Year	10	6	6	66553.67ns	3.078ns	13109.87ns	2.884ns	15.47ns	0.020ns	0.677ns
Different type of OM	6	6	6	31882.396**	31.494*	15774.25*	5.129**	189.50**	0.033*	1.063*
Year* different type of OM	24	18	12	2054ns	8.903ns	12054.96ns	1.920ns	77.083ns	0.026ns	0.575ns
Error I	60	48	36	53364.87	2.144	11271.15	0.995	11.76	0.009	0.441
Different amount of OM	2	2	2	34277.68**	7.779*	10370.48*	2.704**	11.98**	0.001ns	0.349ns
Year* different amount of OM	8	6	4	48670.96ns	1.820ns	10621.78ns	2.878ns	9.87ns	0.003ns	0.298ns
Different type of OM*different amount of OM	12	12	12	31425.14ns	1.490ns	11092.79ns	0.568ns	5.61ns	0.005ns	0.262ns
Year*different type of OM*different amount of OM	48	36	24	34171.28ns	1.893ns	11343.63ns	0.474ns	6.01ns	0.005	0.172
Error II	140	112	84	34162.48	0.947	11507.99	0.463	4.31	0.005	0.220
CV (%)		-		8.43	2.60	6.57	8.21	5.31	7.78	8.81

OM: Organic matter

Group 1: include Seed yield, Seed weight, Bulk density cover five years information.

Group 2: include Plant height cover four years information.

Group 3: include Spike height, Number of spike per square meter, Infiltration rate cover three years information.

ns, * and ** are non-significant and significant at 5 and 1% probability levels, respectively.

Table 4. Mean comparison effect of year on measured traits

Year	Seed yield (kg.ha^{-1})	Seed weight (gr)	Number of spike per square meter	Spike length (cm)	Plant height (cm)	Bulk density (gr.cm^{-3})	Infiltration rate (cm.hour^{-1})
1	4708^{*b}	37.90^{b}	533.0^{a}	8.460^{a}	98.76^{b}	1.353^{b}	0.55^{b}
2	2799^{d}	35.94^{d}	452.9^{a}	8.556^{a}	96.71^{d}	1.300^{d}	0.35^{c}
3	4253^{c}	36.70^{c}	563.1^{a}	7.857^{b}	97.70^{c}	1.341^{c}	1.01^{a}
4	4998^{ab}	37.98^{b}	--	--	99.65^{a}	1.383^{ab}	--
5	5004^{a}	38.70^{a}	--	--	--	1.411^{a}	--

*Similar letters in each column show non-significant difference at 5% level in Duncan's multiple rang test.

Table 5. Mean comparison of effect of different a mount of organic manure on measured traits

Different amount of organic manure (t.ha^{-1})	Seed yield (kg.ha^{-1})	Seed weight (gr)	Number of spike per square meter	spike length (cm)	Plant height (cm)	Bulk density (gr.cm^{-3})	Infiltration rate (cm.hour^{-1})
2.5	4411^{a}	37.73^{a}	563.0^{a}	8.508^{a}	98.61^{a}	1.360^{a}	0.54^{a}
5	4349^{ab}	37.19^{ab}	497.0^{b}	8.270^{ab}	98.15^{ab}	1.356^{a}	0.68^{a}
10	4297^{b}	37.09^{b}	489.1^{b}	8.095^{b}	97.86^{b}	1.355^{a}	0.67^{a}

*Similar letters in each column show non-significant difference at 5% level in Duncan's multiple rang test.

Table 6. Mean comparison of effect of different type of organic manure on measured traits

Different type of organic manure	Seed yield (kg.ha^{-1})	Seed weight (gr)	Spike number per square meter	Spike length (cm)	Plant height (cm)	Bulk density (gr.cm^{-3})	Infiltration rate (cm.hour^{-1})
Cattle manure	4452^{ab}	37.27^{b}	508.0^{b}	8.259^{b}	98.39^{b}	1.320^{d}	0.50^{cd}
Hen manure	4415^{b}	37.80^{b}	526.0^{ab}	8.963^{a}	100.20^{a}	1.351^{bc}	0.60^{bc}
Sugarcane bagasse	4467^{ab}	37.90^{ab}	572.2^{ab}	8.481^{ab}	99.14^{ab}	1.381^{ab}	0.96^{a}
Sugarcane filter cack	4772^{a}	38.67^{a}	652.5^{a}	8.719^{a}	100.10^{a}	1.403^{a}	0.38^{d}
Wheat straw	4019^{c}	36.01^{d}	429.8^{d}	7.556^{d}	96.31^{d}	1.356^{b}	0.83^{b}
Green manure	4022^{c}	36.25^{c}	458.9^{c}	8.185^{bc}	94.22^{e}	1.345^{c}	0.55^{c}
Control	4321^{bc}	36.50^{c}	467.0^{c}	8.074^{c}	98.33^{c}	1.347^{cd}	0.62^{bc}

*Similar letters in each column show non-significant difference at 5% level in Duncan's multiple rang test.

This result, is in accordance with the finding of Lotfi Jala-Abadi *et al.* (2012); Cheraghi *et al.* (2016); Bohme and Bohme (2006). 10 $t.ha^{-1}$ of sugarcane filter cack with 50 $kg.ha^{-1}$ nitrogen led to increased soil phosphorus absorption and does not necessarily require the use of phosphate chemical fertilizer. Application of fresh sugarcane filter cack, compost sugarcane filter cack or with sugarcane bagasse caused improved soil structure and increased microbial activity of the soil (Mello Prado *et al*., 2013).

Number of spike per square meter

Result of analysis of variance showed that the effect of different sources and amounts of organic manure on number of spike per square meter was significant at 5% probability level, but the effect of year and interaction effect of treatments was not significant (Table 3). According to mean comparison result of different amounts of organic manure, the highest number of spike per square meter content belonged to 2.5 $t.ha^{-1}$ treatments (563); however, there was no significant difference between other treatments (Table 5). Assessment of different sources of organic manure revealed that the maximum number of spike per square meter (652.5) was noted for sugarcane filter cack and the minimum of that (429.8) belonged to wheat straw treatment (Table 6). Other researchers such as Mehraban (2013); Davari *et al*. (2012); Benbi and Senapati (2009) reported same result. Prasad and Sinha (2000) reported that farm yard manure (FYM) consumption with wheat residues can reduce 50% of NPK fertilizer use. The use of ten $t.ha^{-1}$ FYM+50% amount of NPK can significantly increase wheat yield and its components compared to the use of 100% NPK alone.

Spike length

According to the result of analysis of variance, effect of year, different sources and amounts of organic manure on spike length was significant at 1% probability level, but interaction effect of treatments was not significant (Table 3). Table 4 indicated that the first and the second year had higher amount of spike length than the third year. Mean comparison result of different amounts of organic manure showed that the maximum and minimum amount of spike length belonged to 2.5 $t.ha^{-1}$ (8.50 cm) and 10 $t.ha^{-1}$ treatment (8.09 cm) (Table 5). Among different sources of organic manure, maximum spike length was obtained for hen manure (8.96 cm) and sugarcane filter cack (8.71 cm) also minimum of that (7.55 cm) was obtained for wheat straw (Table 6). These findings, are in accordance with results of Muneshwar *et al*. (2001); Gupta *et al*. (2012). Sikora and Azad (1993) reported that the consumption of compost of sugarcane filter cake and sugarcane bagasse with 125 $kg.ha^{-1}$ nitrogen and 75 $kg.ha^{-1}$ phosphorus led to a significant increase in wheat yield, yield components and spike length than without the use of organic fertilizer treatment. In addition, the highest yield was related to the ratio of 50% mixing of this compost and chemical fertilizers.

Plant height

Result of analysis of variance showed that the different sources and amounts of organic manure on number of plant height was significant at 1% probability level, but effect of year and interaction effect of treatments was not significant (Table 3). Comparison of different studied years showed that the fourth and the second year had maximum and minimum amount of plant height, respectively (Table 4).

According to mean comparison result of different amounts of organic manure maximum plant height (98.61 cm) was observed in 2.5 $t.ha^{-1}$ and the lowest one (97.86 cm) was found in 10 $t.ha^{-1}$ treatment (Table 5). Between different sources of organic manure, maximum plant height was noted for hen manure (100.20 cm) and sugarcane filter cack (100.10 cm), respectively. Also minimum of that (34.06) belonged to wheat straw (96.31 cm) and green manure (94.22 cm) treatments (Table 6). It seems that the lowest effect of wheat straw and green manure on plant height was related to high ratio of carbon to nitrogen, low growth due to intense activity of soil microorganisms and yellowing of crop. Abedi *et al*. (2010) and Hlisnikovsky and Kunzova (2014) have pointed similar results in this regard.

Bulk density

According to the result of analysis of variance, effect of year and different sources of organic manure on bulk density was significant at 5% probability level, but effect of different amounts of organic manure and interaction effect of treatments was not significant (Table 3). Among different studied years, the fifth and second years had maximum and minimum amount of bulk density, respectively (Table 4). Results of mean comparison showed in different sources of organic manure the minimum bulk density (1.320 $gr.cm^{-3}$) was observed in cattle manure and the highest one (1.403 $gr.cm^{-3}$) was found in sugarcane filter cack treatment (Table 6). Other researchers such as Soleymani *et al*. (2012); Dixit and Gupta (2000); Li *et al*. (2007) reported same result. Application of 10 $t.ha^{-1}$ farm yard manure and wheat residues reduced the soil bulk density from 1.51 to 1.42 $gr.cm^{-1}$. Consumption of this amount of organic manure significantly increased the aggregate stability, soil porosity, hydraulic conductivity and soil storage water capacity (Bhattacharyya *et al*., 2007; Malhi *et al*., 2011). Bandyopadhyay *et al*. (2010) reported that integrated nutrient management strategies decreased the bulk density (9.3%), soil penetration resistance (42.6%), and increased the hydraulic conductivity (95.8%), mean weight diameter of the water stable aggregates (13.8%) and soil organic carbon content (45.2%) compared to the use of only fertilizer. Annual application of 4 $t.ha^{-1}$ farmyard manure along with recommended dose of fertilizers (NPK) significantly improved the grain yield of rainfed soybean by 14.2% over NPK and by 50.3% over use only fertilizer treatment (Hati *et al*., 2006).

Infiltration rate

Result of analysis of variance revealed that effect of year and different sources of organic manure on infiltration rate was significant at 5% probability level, but effect of different amounts of organic manure and interaction effect of treatments was not significant (Table 3). Comparison of different studied years indicated that the third and the second years had maximum and minimum amount of infiltration rate, respectively (Table 4). According to mean comparison result in different sources of organic manure the minimum infiltration rate (0.38 $cm.hour^{-1}$) belonged to sugarcane filter cack and the maximum of that (0.96 $cm.hour^{-1}$) was for sugarcane bagasse treatment (Table 6). This result, were accordance with finding of Rasoulzadeh and Yaghoubi (2010); Singh *et al*. (2007); Hati *et al*. (2006).

Correlation between measured traits

These coefficients were figured out by means of Pearson coefficient. Seed yield as important trait had significant relation with seed weight (0.995^{**}), spike number per square meter (0.980**), spike length (0.751*), plant height (0.596*), bulk density (0.501*). Another researchers such as Benbi and Senapati (2009); Kukal *et al*. (2009); Singh Brar *et al*. (2015) reported same result.

Table 7. Correlation coefficient between measured traits

Traits	SY	SW	SNPSM	SL	PH	BD
SW	0.995**	-				
SPSM	0.980**	0.501*	-			
SL	0.751**	0.590*	0.411ns	-		
PH	0.596*	0.601*	0.359ns	0.502*	-	
BD	-0.691*	0.225ns	0.221ns	0.127ns	0.345ns	-
IR	0.557*	0.337ns	0.119ns	0.229ns	0.224ns	-0.501*

ns, * and **: no significant, significant at 5% and 1% probability level, respectively.
SY: Seed yield, **SW**: Seed weight, **SNPSM**: Spike number per square meter, **SL**: Spike length, **PH**: Plant height, **BD**: Bulk density, **IR**: Infiltration rate.

CONCLUSION

To avoid the use of fresh wheat straw in the soil, it is necessary to first carry out chopping of wheat residues and allow decay and impregnation with urea was carried out so that, after reducing the ratio of carbon to nitrogen, wheat straw can be used in the soil. Such an operation is necessary for wheat straw, as it is one of the most suitable sources of organic manure, because it is rich in terms of some nutrients and it is one of the easiest and most economical sources for most farmers. When using hen manure, it is necessary to be careful about the use of nitrogen fertilizer. It seems that after the establishment of wheat seedlings, there was is no need to use dressing fertilizers especially in the amount of 5 and 10 tons per hectare of hen manure. Because this type of organic manure is rich in nitrogen and it provides nitrogen during the growth period of the plant. The results of this study also, indicate that the highest effect of hen manure was on the plant height and spike length (in general, the growth trend of the plant). Totally, sugarcane filter cack, sugarcane bagasse and cattle manure had a positive effect by increasing the wheat yield, seed weight, number of spike per square meter, spike length and plant height. Wheat straw also plays a major role in improving the physical properties of the soil. It is recommended to use at least 2.5 tons per hectare of sugarcane filter cack, sugarcane bagasse or cattle manure (access to each one that is easier and more practical) for 4 years or more.

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