Raising the Efficiency of Calcareous Sandy Loam Soil Production by Applying Organic Low Economic Value

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ABSTRACT

A field experiment was undertaken at the Nubaria Agricultural Research Station farm in two consecutive years, 2019/2020 and 2020/2021. (Calcareous soil). The goal of this study was to improve the poor state of calcareous sand loamy soil, increase its efficiency, and convert the negative impact of certain by-products, such as sugar beet waste (low economic value), on pollution into a positive impact on agricultural soil qualities. The effect and residual effect of different organic amendments (sugar beet waste (S.B.W.), compost (Comp), sugar beet waste 50 percent combined with compost 50 percent application under two different tillage practices of tillage surface (P1) and deep tillage (P2) on some soil hydro-physical and chemical properties, as well as canola and sunflower seeds yields tonfed^{-1}, were investigated. In the first and second years for surface tillage P1, employing (S.B.W) in combination with compost treatment yielded the greatest values of O.C percent. 83 percent and O.C.F 17.7 percent, respectively. The addition of diverse organic amendments had a substantial influence on each of the hydro-physical and chemical parameters, such as USC and Db, with the lowest values for Db being 1.29 in the second winter season, highlighted by S.B.W. mixed with compost treatment. Applying the same treatment under deep tillage technique (P2) 2.79, 2.8 USC for two summer seasons, respectively, yielded the lowest USC value. The application of mixed sugar beet with compost treatment resulted in the greatest mean values for Kh (cmh^{-1}), I.R (mmh^{-1}) and porosity percent, which were 3.92 P2 Kh (cmh^{-1}), 6.94 P2 I.R (mmh^{-1}) and 50 P2 E percent for both winter seasons. Data indicated that when various organic amendments were applied to big aggregate size fractions >2mm (by percentage), the aggregate sizes dispersion tended to increase. In comparison to the control treatment, 4.05 percent S.B.W, 13.76 percent Comp, and 15.8 percent combination S.B.W with compost treatments were found. For both surface and deep tillage, the greatest values for aggregate state and degree owing to treatment (Comp and S.B.W) were about 72.88 percent aggre. state and 76.6 percent aggre. Degrees also account for 42 percent of aggre. state and 47.95 percent of aggre. degrees, respectively. The greatest mean A.S.I values were achieved using the (Comp and S.B.W) treatments with P1 (0.82) and P2 (0.7), respectively. Which were thought to be excellent A.S.I. Conversely, the largest seed yields of canola or sunflower plants were achieved with the application of S.B.W mixed with Comp. by both surface and deep tillage, yielding 1.19 (P1), 0.981 (P2) ton fed^{-1} of canola plant and 1.56, and 1.51ton fed^{-1} of sunflower plant, respectively. For both surface and deep tillage, however, both S.B.W and Comp. treatments, either alone or in combination, resulted in significantly higher R.I.Y than the control. However, for improved yield and water consumption, more effort of organic amendments with low economic value on economic and ecological sides should be considered.

Keywords: calcareous sandy loam**,** canola, sunflower, agricultural wastes, tillage

1. Introduction

The 1.5 million fed. (fed.= 4200m^2) initiative helps Egypt close the food gap and achieve self-sufficiency in important crops including wheat and maize, as well as oil crops. The project spans significant swaths of the country, including Upper Egypt, the south of the valley, Sinai, and the Delta, which were chosen after extensive research. Closing the food gap that the nation is experiencing.

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Improving the physical and chemical qualities of calcareous lands, improving the efficiency of development, increasing the productivity of calcareous soils, and attempting to attain Egyptian oil crop self-sufficiency (for example, sunflower and canola).

In Egypt, agricultural soil is the most essential component in agricultural productivity. It was only natural to cultivate additional land, whether sand or limestone desert. In terms of physical and chemical qualities, water behavior, and fertility, these soils are deficient. One of the most prevalent procedures for improving soil physical qualities has been the addition of organic materials of diverse sources to the soil Azza Ahmed (2018) and Celik *et al.,* (2004).

The application of soil supplements, such as compost, to calcareous soil improved the physical and chemical qualities of the soil. Manufacturing waste by-products, which turn factory waste's detrimental influence on the environment into a positive effect on improving the bad conditions of limestone soils, are a necessary environmental voice. Sugar beet leftovers, for example, are among these wastes.

The canola plant is one of the newest crops for the production of oilseeds, and it is drought resistant in dry places, as well as having low nutritional needs, particularly in sandy calcareous soils. Because these soils are less fertile and generate relatively good economic yields with little NPK fertilizer when combined with compost, canola growing in these soils is beneficial (Awaad *et al.,* 2009).

Sunflowers are oilseed plants that produce oil that is rich in essential fatty acids, the majority of which are polyunsaturated. Sunflower oil is made up of polyunsaturated fats like linoleic acid (which makes up 59 percent of the total) and monounsaturated fats like oleic acid (which makes up the rest) (30 percent of the total).

Since 2017, sunflower farming has been improved to boost production in order to fulfill rising customer demand for sunflower oil. (Hélène *et al.,* 2017; Rauf *et al.,* 2017).

The goal of this study is to improve the efficiency of poor calcareous loam sand soil as well as to convert the negative effects of various by-products, such as sugar beet wastes low economic value on pollution, to a positive impact.

2. Materials and Methods

During the winter, Canola, and summer seasons sun flower 2019/2020 & 2020/2021, a research study was done on the farm of Nubaria Agricultural Research Station (calcareous sandy loam soil). With four replicates, the experimental design was set up in a split plot. To examine the impact of the applied treatments on improving calcareous soil productivity, the main plots were tillage and the amendment treatments were sub-main plots.

To determine the study's goal, the experiment was repeated in the same place in 2020/2021 and summer 2021. Tables (1, 2, and 3) show some physical and chemical parameters of the original tested soil and organic amendment, respectively. According to Black *et al.* (1965), soil characteristics were determined Klute, (1965)

Table 1: Some soil physical analysis of the investigated soil.

Experimental year	Soil depth cm	Mechanical analysis			Soil texture	UCS ton Ft^{-2}	Kh Cm h^{-1}	IR mm h^{-1}	E (%)	A.W (%)
		Sand %	Silt %	Clay %						
2019/20	0-30	55.71	25.11	19.18	S.L	3.93	1.94	4.56	46.91	25.13

UCS: Unconfined compressive strength (ton Ft^{-1}). K_h: Hydraulic conductivity cmhr^{-1}. IR: Infiltration rate mmhr^{-1}.
E: Total porosity (%).   A.W: Available water (%). S.L: Sandy loam.

Table 2: Some soil chemical analysis of the investigated site for two experimental winter and summer seasons.

Experimental year	Soil depth	Soil pH (1:2.5)	E.C (ds/m)	Available macronutrients (ppm)			Total N%	O.M %	CaCO3 %
				N	P	K			
2019/2020		8.22	2.18	37.3	2.68	77.3	0.1	0.27	22.8

Table 3: Chemical analysis of used organic amendments samples.

Amendments	pH 1:10	E.C (dSm⁻¹)	OC %	Total N %	C/N ratio	Total P %	Total K %
Compost	7.30	3.1	23.43	1.38	16.97	0.62	1.70
	pH 1:10	**E.C (dSm⁻¹)**	**OC %**	**Total N %**	**C/N ratio**	**P %**	**Total K %**
Sugar beet waste	7.2	2.95	34.3	3.3	10.24	0.50	3.8

2.1. Experimental treatments

Treatments for tillage: surface tillage (zero – 30) and deep tillage (zero – 60) the kind of treatments 1- sugar beet waste (outperform or liming on its own and applied by 6 tonfed-1, 2- compost applied as 8 ton fed and combine of compost with sugar beet waste by applied 50% from each of them. Three adjustments were ground to less than 5mm and applied based on their O.C percent content. Sugar outperformed waste (before liming) on its own (S.B.W) Sugar beet combined with compost (comp.), as added by 50% of each, Compost alone (comp.), 8 ton fed-1 Control treatment (cont.)

2.2. Winter field experiment (Canola plant)

For each winter season, the experimental field was prepared, homogeneously mixed with additives (sugar beet waste) and compost, and 4 Kg fed⁻¹ Canola seeds were sown at a rate of 4 Kg fed⁻¹ Canola seeds in the second week of November. The experimental plot was 14m2 in size. At the land preparation, phosphorus fertilizer in the form of mono-superphosphate (15.5 percent P_2O_5) was applied at a rate of 45 kg P_2O_5 fed⁻¹ . Ammonia nitrate 33.5 N was used as a nitrogen fertilizer at a rate of 60 kg N fed⁻¹ . After 45 and 75 days following planting, potassium fertilizer in the form of potassium sulphate (48 percent K_2O) was applied at a rate of 24 Kg K_2O fed⁻¹ in two equal doses. All fertilizers were applied in accordance with the Ministry of Agriculture's recommendations.

2.3. Summer field experiment (Sun flour plant)

Seeds of the sun flour plant Sakha 53 were grown at a rate of 4 kg fed⁻¹ in two summers, seasons 2020 and 2021, during the first week of June for each season to evaluate the residual impact of the applied amendments under the identical treatments. 14m2 was the entire area. Phosphorus mineral fertilizer, potassium fertilizer 1, and nitrogen fertilizer were applied in the amounts recommended.
• The entire yield for each plot for various seasons (winter and summer) was weighed and converted to ton ha⁻¹ at the harvesting stage. At harvesting time in each season, soil samples were taken at a depth of 0-15 cm. Black *et al.,* provided techniques for determining soil bulk density and hydraulic conductivity, as well as soil penetration resistance, infiltration rate, and total soil porosity (1965). Also, according to Jackson, when determining organic carbon percent (1958). It was also taken into account while calculating organic carbon fixation (O.C.F) using the following equation:

$$(OCF) = \frac{OC\ \%\ added - OC\%\ reminded}{OC\%\ reminded} \quad \text{Buondonno } et\ al.,\ (1998)$$

•Yoder's wet-sieving technique was used to determine the size distribution of water stable aggregates (1936). [greater than 2 mm, 1 mm, 0.5 mm, 0.25 mm, 0.125mm,.063mm] was the aggregate size determined.

• Aggregation state percent (Agg. state) = sum of after-dispersion diameters X 100.

• Aggregation degree percent (Agg.degree) = sum of undispersion diameters / sum of undispersion diameters / 100.

• A.S.I. (aggregation stabilization index) = (sum the diameter undispersion - sum the diameter after dispersion) X 0.02 (Factor) Fixed factor = 0.02.

The information gathered was statistically examined using MSTAT processes (1990). All of the investigated variables were evaluated in terms of their form profitability.

3. Results and Discussion

3.1. Effect of different tillage and organic amendments sources on some physic - chemical properties of calcareous soil.

3.1.1. Soil organic carbon S.O.C and soil organic carbon fixation O.C.F.

By measuring hydraulic conductivity (cmh^{-1}), infiltration rate mmh^{-1} (I.R), total porosity (E percent), and penetration resistance Unconfined compressive strength, organic amendments have been widely acknowledged as an efficient way of increasing soil hydro-physical and physic-chemical parameters (UCS ton Ft^{-1}). Although SOC is not a real soil physical quality indicator, research has shown that it has a strong correlation with a number of soil physical qualities. However, in the current research, using organic supplements such as sugar beet waste low economic value (S.B.W) or compost (Comp) alone or in combination with sugar beet waste 50 percent and compost 50 percent boosted the SOC and, as a result, considerably altered the physical qualities.

Figure 1 depicts the influence of various organic amendments on the proportion of SOC. For two winter and summer seasons, the S.O.C percent values increased considerably when all treatments were applied, ordered in ascending sequence cont., S.B.W. Comp, and combined S.B.W with compost treatments. At the same time, using surface tillage method increased S.O.C percent values greater than performing deep tillage once, treatments for two winter and summer seasons. At the same time, the computation of O.C fixation must be given top priority due to its impact on the maintenance and sustainability of organic soil carbon (Koné, 2022) .
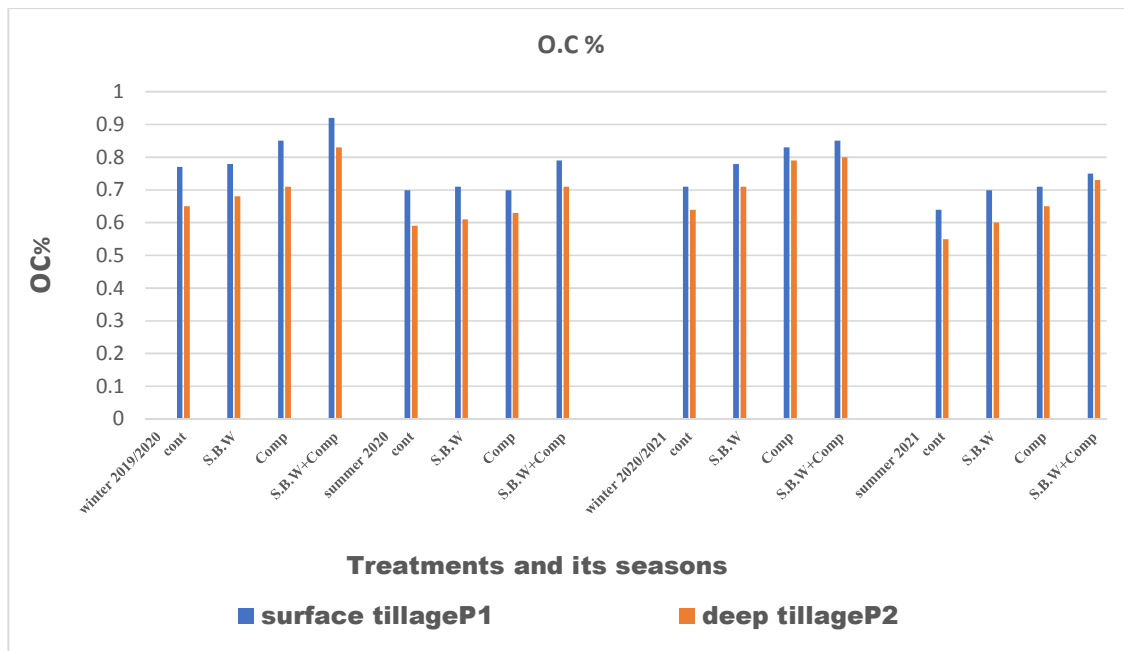

Fig. 1: Effect all treatments on Soil organic carbon SOC % of two years2019/ 2020 and 2020/2021 experiments.
Control = Cont. Sugar beet waste=S.B.W Compost= Comp.
L.S.D. at 5 % 0.056 e tillage L.S.D. at 5 % 0.0696 organic amendments

Fig. (2) demonstrated that applying S.B. W single or combined with compost treatments were ascertained highest value of O.C F 15.5and 17.7% in the second year for surface tillage practice, respectively.
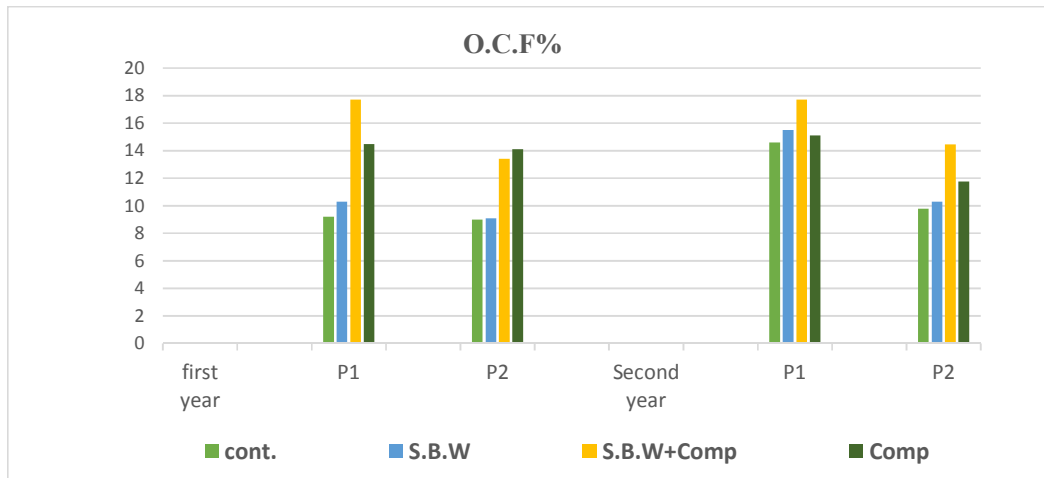
Fig. 2: Effect all treatments on Soil organic carbon OCF % of average two years 2019/ 2020 and 2020/2021 experiments.

Control = Cont. Sugar beet waste= (S.B.W) Compost= (Comp.), P1-surface till age P2 deep tillage

3.2. Effect of the different treatments on soil aggregate fractions (average the two experimental seasons 2019/2020 and 2020/2021).

3.2.1. Effect organic amendments sources on aggregate size distribution %.

The effect of different organic amendments sources such as sugar beet waste (S.B.W) or compost (Comp) and combinations of sugar beet waste and compost on the aggregate size distribution of calcareous soil data in Fig. (3) revealed that different organic amendments sources such as sugar beet waste (S.B.W) or compost (Comp) and combinations of sugar beet waste and compost treatments have an effect on some chemicals-physical properties. The use of organic amendments, on the other hand, dramatically enhanced aggregate size particles (Dan-Bi Lee *et al.,* 2022). While data showed that the aggregate sizes distribution to more than 2.0 S1, 2.0-1.0S2, 1.0-0.5S3, 0.5-.025S4, 0.25-0.063S5, and less than 0.063S6 mm diameters tended to increase due to the application of sugar beet waste (S.B.W) or compost (Comp) treatments, as well as a combination of sugar beet waste with and compost treatments, towards large aggregate size fractions >2mm (by percentage 4.05 percent (without any addition). Small aggregation fractions (micro aggregates) containing ancient carbon make up huge aggregation fractions (macro aggregates) (C). The macro aggregates sustaining SOM were thought to be younger and more transitory. In comparison to mineral fertilizer (NPKS and NK) or control without organic fertilizer, Yang *et al.,* (2007) found that both medium and high levels of organic fertilizer application coupled with ca enhanced the fraction of big water and dry stable aggregates (>2mm). Also, according to Azza *et al.,* (2011), increasing the percentage of macro-aggregate and decreasing the percentage of micro-aggregate with either Blue green algae (BGA) or organic amendments may be due to the fact that these materials act as a cementing agent by releasing active organic acids and polysaccharides during the microbial decomposition of organic residues.
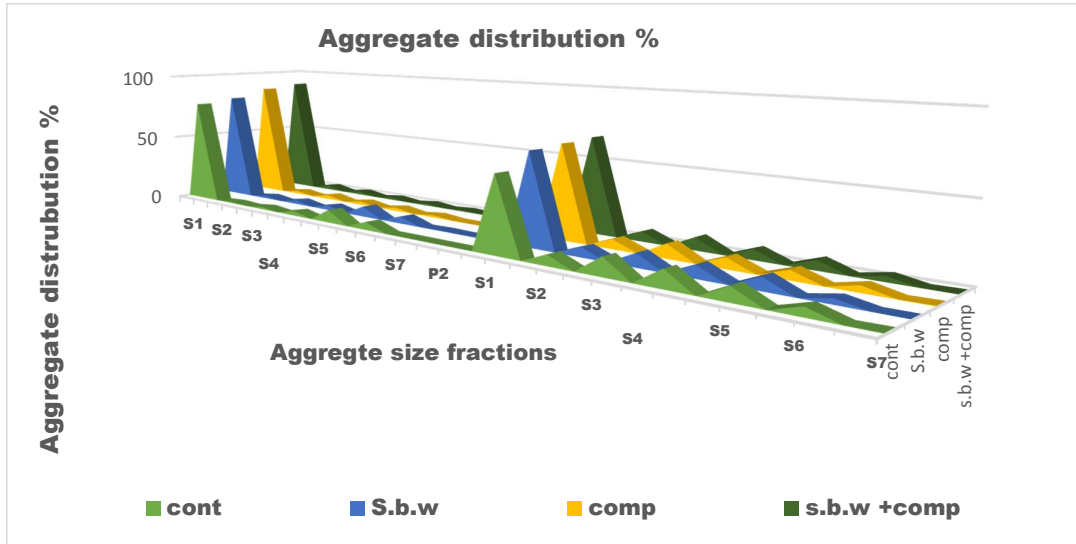
Fig. 3: Effect treatments on dry aggregation size distribution average of two years 2020and 2021 experiments.

Control = Cont Sugar beet waste= (SBW) Compost= (Comp.)

Particles size	L.S.D. 0.05	
	P	A
≥2mm(S1)	1.11	1.2760
2-1mm (S2)	0.292	0.3356
1-0.5mm (S3)	0.251	0.2875
0.5-0.25mm (S4)	0.241	0.2816
0.25-0.125mm (S5)	0.23	0.2708
0.125-0.063mm (S6)	0.240	0.2757
<0.063mm (S7)	0.0081	0.0110

p = irrigation intervals. A= organic amendments.

3.2.2. Effect of different organic amendments sources on aggregate state and aggregate degree%.

The results in Fig. (4) also showed that all of the adjustments had an influence on the proportion of aggregation states and the degree of aggregation. Fig. (4), on the other hand, showed that the application of sugar beet waste (S.B.W) or compost (Comp) and combined sugar beet waste with compost treatment resulted in an increase in aggregation state and degree percent for both surface and deep tillage, arranged in ascending order control, S.B.W, (Comp and S.B.W) treatment, respectively. Surface tillage, on the other hand, generated greater significant values for both aggregation condition and degree than deep tillage. For both surface and deep tillage, the maximum values for aggregate state and degree owing to applying the combination treatment (Comp and S.B.W) were around 72.88 percent aggre. state, 76.6 percent aggre. degree, and 42 percent aggre.state, 47.95 aggre degree, respectively.

According to Yang *et al.,* (2007), large quantities of FYM resulted in S accumulation in bulk soil and C and S accumulation in most aggregates, although the pattern of accumulation varied depending on aggregate size and the element (C, N, and S) studied.
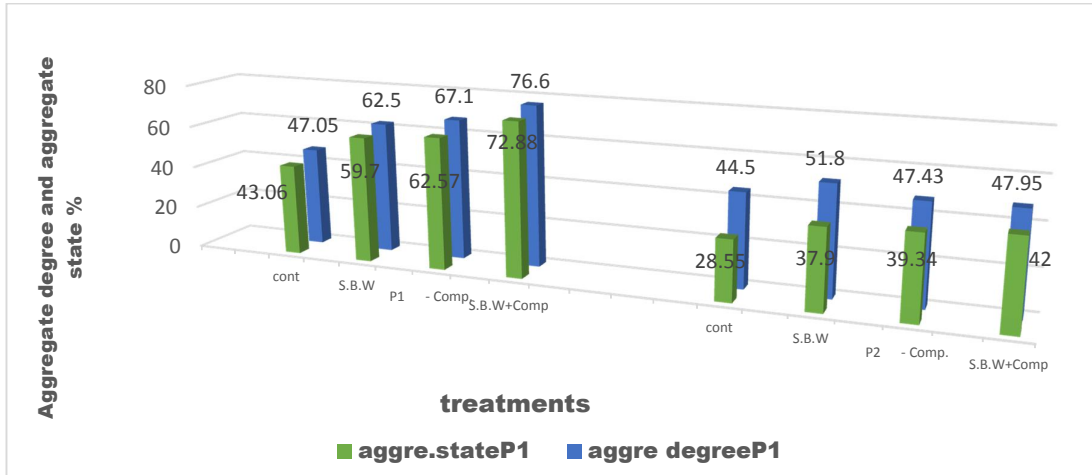
Fig. 4: Effect of Treatments on aggregation state% and aggregation degree % average of two years 2020 and 2021.

Control = Cont Sugar beet waste= (SBW) Compost= (Comp.)

Items	L.S.D. 0.05	
	P	**A**
Aggregation state Agg. state	0.9231	1.049
Aggregation degree Agg. degree	0.7333	0.901

3.2.3. Aggregation stability index A.S.I

It's worth noting that a good aggregation index should have a value near to one Yang *et al.,* (2007). According to the data in Fig. (5), the control treatment had a low A.S.I of 0.4 and 0.39 for surface and deep tillage, respectively. Because all treatments were applied, the aggregation stability index A.S.I values were organized as control S.B.W comp (S.B.W+Comp). It is obvious that surface tillage had a greater impact on A.S.I values than deep tillage. Applied (Comp and S.B.W) treatments with surface (.82) and deep tillage0.7, respectively, had the highest mean values of A.S.I. Which were thought to be excellent A.S.I. Furthermore, there was a considerable difference between surface and deep tillage.
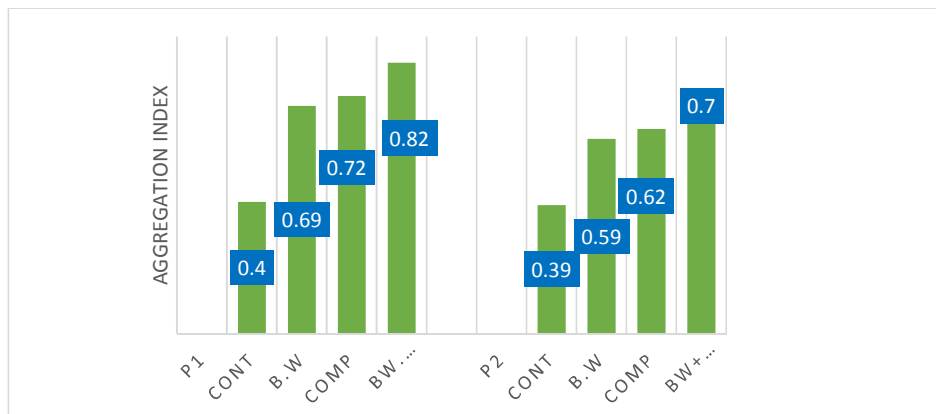

Fig. 5: Effect of treatments on aggregation stability index A.S.I average two years 2020 and 2021.
L.S.D at 0.05 P (Tillage) = 0.371 A (amendments) = 0.0428
Control = Cont Sugar beet waste= (SBW) Compost= (Comp.).

3.3. Effect of different tillage and organic amendments sources on soil hydro- physical properties

By measuring hydraulic conductivity (cmh^{-1}), infiltration rate mmh^{-1} (I.R), total porosity (E percent), and penetration resistance unconfined compressive strength, the effect of different tillage and organic amendments sources alone as sugar beet waste (S.B.W) or compost (Comp) and combinations of sugar beet waste 50 percent and compost 50 percent on some soil hydro-physical properties has been detected (UCS ton Ft^{-1}).

3.3.1. Soil penetration resistance (Unconfined compressive strength) and bulk density

Under wetting and drying circumstances, the studied soil develops a hardness layer due to its high CaCO3 concentration. The data in table (4a,4b) showed that adding organic amendments such as sugar beet waste (S.B.W.) and compost (Comp.) alone or in combination reduced the USC (ton/ft2) and Bd (gcm-3) values by about -19.54 percent P1 and -19.6 percent P2 for U.C.S, and by -19.4 percent P1 and 19.04P2 for Bd for two winter seasons 2019/2020 and 2020 For the first and second winter seasons, the treatments reduced bulk density by -2.2 percent P1 and -1.4 percent P2 and 3 percent for both P1, P2 than the control. Furthermore, as compared to the control, the bulk density values of all treatments decreased by 4% P1 and 3.4 percent P2 for an average of two summer seasons. In the second winter season, a combination of sugar beet waste 50 percent and compost 50 percent treatments with depth tillage treatment 1.29 resulted in the lowest USC and Db values. Applying sugar beet waste mixed with compost treatment under depth tillage method (P2) 2.79, 2.8 USC for two summer seasons, respectively, yielded the lowest USC value. There is no statistically significant difference between the therapies, according to the data. This outcome might be attributable to the usage of organic amendments, which reduced soil resistivity before. As organic material decomposes throughout the growing season, this material enhances the soil aggregation process, lowering penetrability resistance (Azza Ahmed *et al.,* 2013).

Table 4a: Effect of organic amendments on some soil hydro-physical properties in the surface layer 2019/2020 winter season / 2020 summer seasons).

Treatments	Surface tillage(P1) winter season (2019/2020) Canola					Mean	Surface tillage(P1) summer season (2020) Sunflower					Mean
	Db	Kh	I.R	E %	UCS		Db	Kh	I.R	E %	UCS	
Cont.	1.37	2.17	4.82	47.31	3.89	11.91	1.37	2.54	4.87	47.31	3.81	11.98
S. B.W.	1.35	3.42	6.42	48.08	2.91	12.44	1.36	3.58	6.58	48.46	2.88	12.57
Comp.	1.33	3.56	6.53	48.85	2.87	12.62	1.34	3.71	6.71	48.85	2.81	12.68
Comp. + B.W.	1.31	3.86	7.14	49.61	2.84	12.95	1.33	3.96	6.86	50.00	2.79	12.99
Mean	1.34	3.25	5.82B	48.46	3.13	12.46	1.34	3.45	6.26	48.66	3.07	12.56
L.S.D. at 5 %	P =0.0230 A=0.0230						P*A = 0.0515 P =0.1000 A=0.08 P*A ===					
L.S.D. at 5 % For each measurement	0.020	0.149	0.166	0.396	0.096		0.031	0.143	0.114	0.331	0.083	
Treatments	Depth tillage (P2) winter season (2019/2020)					Mean	depth tillage (P2) summer season 2020 Sunflower					Mean
	Db	Kh	I.R	E %	UCS		Db	Kh	I.R	E %	UCS	
Cont.	1.38	2.53	4.88	46.91	3.87	11.91	1.37	2.66	4.92	47.31	3.78	12.0
Beet W.	1.37	3.49	6.27	47.31	2.88	12.26	1.36	3.64	6.36	49.61	2.84	12.9
Comp.	1.35	3.68	6.69	48.08	2.85	12.53	1.34	3.77	6.75	48.08	2.82	12.6
Comp. + B.W.	1.33	3.92	6.87	48.85	2.82	12.76	1.31	3.98	6.94	47.31	2.80	12.35
Mean	1.36	3.41	6.18	47.79	3.11	12.37	1.35	3.51	6.24	48.08	3.06	12.5
L.S.D. at 5 %	P2 =0.0857		A=0.0766 P x A =0.1714				P2 =0.1438 A=0.1286 P x A =0.2877					
% L.S.D. at 5 % For measurement	0.025	0.082	0.140	0.680	0.130		0.027	0.112	0.162	0.307	0.106	

Db = Soil bulk density (gcm^{-3}); Kh = Hydraulic conductivity (cmh^{-1}); IR = Infiltration rate (mmh^{-1});
E = Total porosity (%); UCS = Unconfined compressive strength (ton/ft^2)
Control = Cont Sugar Beet= Waste (SBW) Compost= (Comp.)

3.3.2. Soil hydraulic conductivity, Infiltration rate and porosity %

Table (4a, 4b) shows that applying various organic amendments sources resulted in a progressive considerable improvement in hydraulic conductivity, infiltration rate, and soil porosity percent values. Organic amendments such as sugar beet, compost, and a combination of the two had a significant effect on each of the Kh (cmh^{-1}), I.R(mmh^{-1}) and porosity percent values in ascending order control treatment, sugar beet treatment, compost treatment, and a combination of the two for two winter 2019/2020 and summer

2020/ 2021 seasons, respectively. For the winter seasons 2019/2020 and 2020/ 2021, the values of Kh, I.R, and porosity were considerably higher than the control by 49.77 percent P1, 34.78 percent P2 and 50.2 P1, 30.7 P2 for kh and 20.75 P1, 26.63, 26.1, 25.91P2 for IR and 2.4 P1, 1.88 P2, 2.9 P1, 3.66 P2 for E percent. The data in table (4 a, b) indicated the same pattern for all treatments over the summers of 2019 and 2021, with hydraulic conductivity, infiltration rate, and porosity percent all increasing compared to the control treatment. The application of combined sugar beet with compost treatment, on the other hand, yielded the greatest mean values for Kh (cmh^{-1}), I.R (mmh^{-1}) and porosity percent (3.92 P2 Kh (cmh^{-1}), 6.94 P2 I.R (mmh^{-1}) and 50 P2 E percent for both winter seasons. Also, the maximum mean value was remarket for 3.98 Kh (cmh^{-1}), 6.98 I.R (mmh^{-1}) and 51.15 porosity percent for two summer seasons, respectively, using the same treatment (sugar beet waste and composts).

Table 4b: Effect of organic amendments on some soil hydro-physical properties in the surface layer 2020/2021 winter season / 2021summer season).

Treatments	Surface tillage (P1) Canola 2020/2021						Surface tillage (P1) Sunflower 2021					
	Db	Kh	I.R	E %	UCS	Mean	Db	Kh	I.R	E %	UCS	Mean
Cont.	1.38	2.21	4.98	46.91	3.84	11.86	1.37	2.27	5.14	47.31	3.82	11.98
Beet W.	1.36	3.50	6.58	47.69	2.98	12.42	1.32	3.72	6.72	48.46	2.83	12.76
Comp.	1.34	3.68	6.67	48.46	2.96	12.62	1.34	3.58	6.63	49.23	2.86	13.14
Comp. + B.W.	1.30	3.89	6.88	50.00	2.90	12.99	1.28	3.90	6.97	50.77	2.80	12.57
Mean	1.35	3.32	6.28	48.27	3.17	12.47	1.33	3.37	6.37	48.94	3.08	12.61
L.S.D. at 5 %	P =0.179 A=0.1601			P x A = P =0.1065			A=0.0953 P x A =0.2130					
Treatments	Depth tillage (P2) Canola 2020/2021						Depth tillage (P2) Sunflower 2021					
	Db	Kh	I.R	E %	UCS	Mean	Db	Kh	I.R	E %	UCS	Mean
Cont.	1.38	2.60	4.94	47.31	3.79	11.99	1.36	2.62	4.95	47.31	3.75	11.99
Beet W.	1.36	3.50	6.31	48.85	2.91	12.59	1.29	3.49	6.22	49.61	2.89	12.74
Comp.	1.31	3.61	6.74	49.61	2.86	12.82	1.27	3.74	6.57	50.38	2.87	13.0
Comp. + B.W.	1.29	3.89	6.92	50.38	2.94	13.08	1.31	3.93	6.98	51.15	2.82	13.44
Mean	1.3	3.4	6.22	49.04	3.13	12.6	1.31	3.45	6.23	49.61	3.08	12.94
L.S.D. at 5 %	P =0.0931		A=0.0833		P x A =0.1863		P=0.1126 A=0.1007 P xA=0.2252					
L.S.D. at 5 % For measurement	0.092	0.115	0.197	0.530	0.057	0.055	0.221	0.262	0.453	0.213		

Db = Soil bulk density (gcm^{-3}); Kh = Hydraulic conductivity (cmh^{-1}); IR = Infiltration rate (mmh^{-1}); E = Total porosity (%); UCS = Unconfined compressive strength (ton/ft^2) Control = Cont Sugar Beet= Waste (SBW) Compost= (Comp.)

3.3.3. Effect of different tillage and organic amendments sources on yield tonfed^{-1} and relative increasing yield% for both canola and sunflower plant average two winter and summer seasons.

Table (5) also revealed that the highest grain yields of canola and sunflower plants were obtained with the treatment of sugar beet waste combined with compost by applying both surface and deep tillage, yielding 1.19 P1, 0.981P2 ton fed^{-1} of canola plant and 1.56, 1.51 for sunflower plant, respectively, with the difference between surface and deep tillage being significant.

Table 5: Effect of different organic amendments sources on yield tonfed^{-1} and relative increasing yield % with surface and deep tillage practices for Canola and sun flower plants average two winter and summer seasons.

Treatments	Average two winter seasons years 2019/2020 and 2020/2021		R.I.Y	R.I.Y	Average two summer seasons 2019 and 2020		R.I.Y	R.I.Y
	Surface tillageP1	Deep tillageP2	Surface tillageP1	Deep tillage P2	Surface tillageP1	Deep tillage P2	Surface tillageP1	Deep tillageP2
	Grain Yield of Canola tonfed^{-1}	Grain Yield of canola tonfed^{-1}			Grain Yield of sunflower ton^{-1}	Grain Yield of sunflower ton^{-1}		
Control	0.768	0.701			1.3	1.28		
S.B.W	0.934	0.817	21.61	16.54	1.41	1.36	8.46	6.25
Comp	0.968	0.880	26.04	25.53	1.53	1.48	17.69	15.62
S.B.W+ Comps	1.19	0.981	54.94	39.94	1.56	1.51	20.0	17.97

The maximum relative increasing yield (RIY) of canola and sunflower plants was also achieved by using the same treatments, which were 54.94, 20.0, and 54.94, respectively, during the winter and summer seasons of surface tillage. This might be attributed to an increase in the number of macro and micronutrients on the top layer. For both surface and deep tillage, however, both S.B.W and Comp treatments, either alone or in combination, resulted in a substantial increase in RIY compared to the control (Rigon *et al.,* 2018)

Conclusion

This paper describes a two-year field experiment that looked at the influence of various tillage techniques and organic additions of low economic value on soil physical, hydraulic, and chemical characteristics, as well as yield. By measuring hydraulic conductivity (cmh^{-1}), infiltration rate mmh^{-1} (I.R), total porosity (E% percent), bulk density, and penetration resistance, both surface tillage and organic additions had favorable impacts on soil hydro-physical and physic-chemical parameters. Aggregation and unconfined compressive strength (UCS ton Ft^{-1}) they boosted grain production for both canola and sun flower plants, and the total results were equivalent under surface and deep tillage. As a result, in calcareous soil, both surface and deep tillage have the potential to boost production. However, in order to enhance yield and water utilization, the impact of organic amendments with low economic value on economic and ecological issues should be addressed

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