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*Interactions between humic substances and organic amendments affecting soil biological properties and growth of *Zea mays* L. in the arid land region*

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Table 1. chemical composition of the organic materials (Alfalfa residues (*Medicago sativa* L.) and sheep manure

	Alfalfa residues %	Sheep waste %
Nitrogen	3.50	1.10
phosphor	0.89	0.35
potassium	0.80	0.50
carbon	48	30
carbon:nitrogen	13	27
cellulose	15	25
lignin	8	15

Table 2. Correlation coefficient between soil parameters and aggregate stability, organic carbon and bulk density (n=18).

Soil parameter	Aggregate stability	Organic carbon	Bulk density
Organic carbon	0.74***		
Bulk density	-0.19	-0.69***	
Bacteria	0.82***	0.72***	-0.07
Fungi	0.78***	0.81***	-0.3
Microbial activity	0.44	0.74***	-0.64***

Indicates significance at the $p < 0.05$ (*); $p < 0.01$ (**); $p < 0.001$ (***)

Table 3. Correlation coefficient between soil parameters and plant height, plant weight (n=18).

Soil parameter	Plant height	Plant weight
Organic carbon	0.70***	0.67***
Bulk density	-0.78***	-0.52*
Aggregate stability	0.29	0.53
Microbial activity	0.61**	0.82***
Bacteria	0.36	0.33
Fungi	0.49*	0.63**
Porosity	0.78***	0.52*

Indicates significance at the $p < 0.05$ (*); $p < 0.01$ (**); $p < 0.001$ (***).

Figure 1. Interaction ($p < 0.001$) plot between treatments (control, alfalfa residues+ humic acid, sheep manure, alfalfa residues, sheep manure+humic acid and humic acid) and incubation period (30 day, 50 day, 70 day) for the microbial activity $\text{CO}_2\text{-C Mg g}^{-1}$ in soil. (Bars represent standard errors). Different superscript letters (a, b, c, d, e, f, g, h, i, j, k, m, n, o) represent the statistical deference.

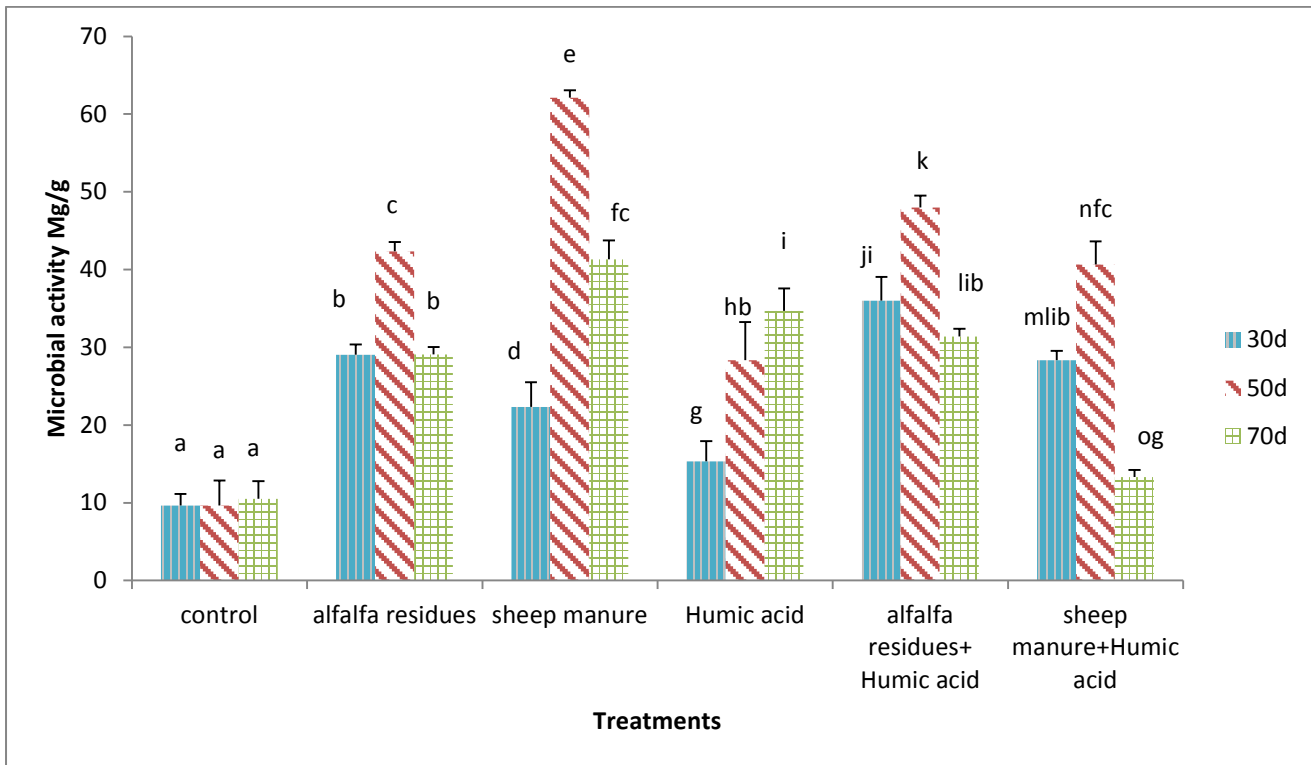


Figure 2 . Effect of treatments (control, alfalfa residues+ humic acid, sheep manure, alfalfa residues, sheep manure+humic acid and humic acid) on bacterial population ($\text{CFU} \times 10^6 \text{ g}^{-1}$ dry soil). (Bars represent standard errors) . Different superscript letters (a, b, c, d, e, f) represent the statistical deference.

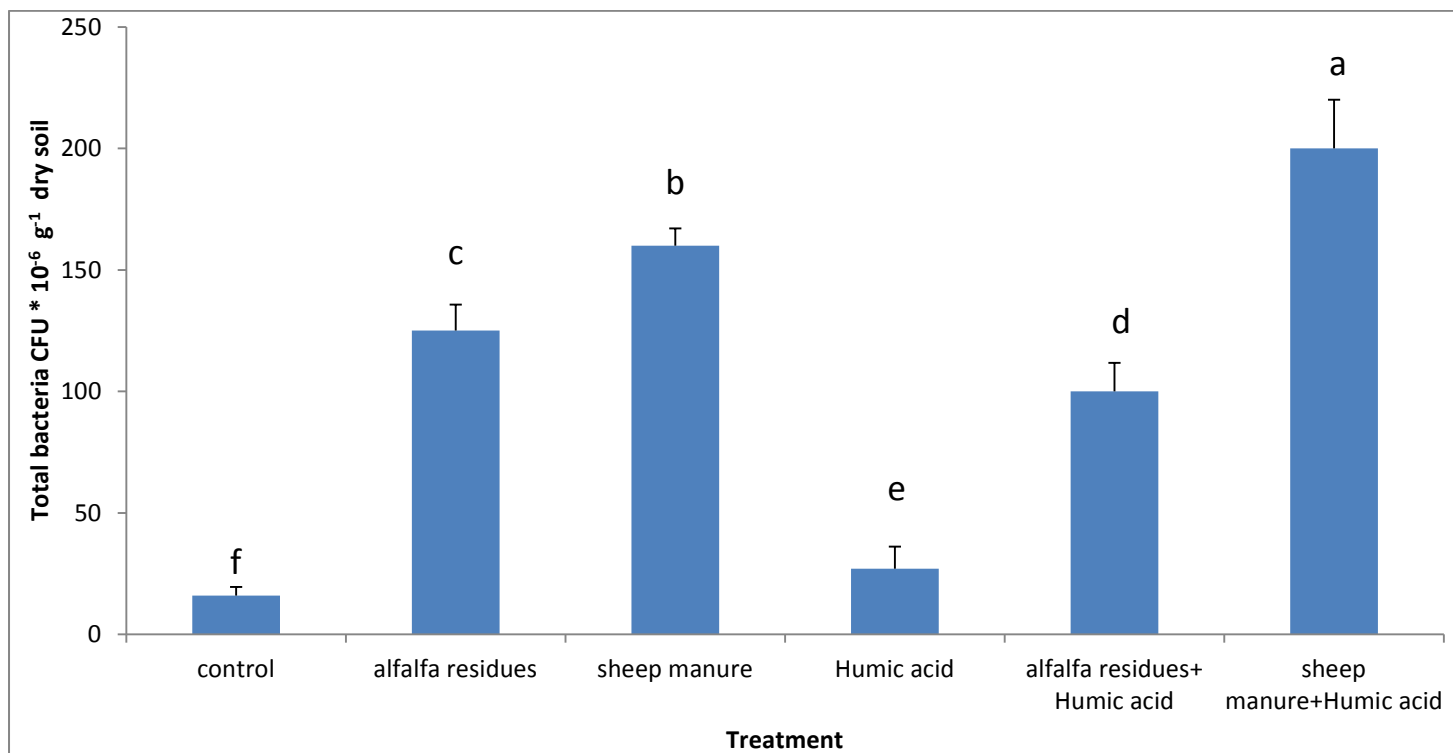


Figure 3 . Effect of treatments (control, alfalfa residues+ humic acid, sheep manure, alfalfa residues, sheep manure+humic acid and humic acid) on fungal population (CFU× 10⁶ g⁻¹ dry soil). (Bars represent standard errors) . Different superscript letters (a, b, c, d) represent the statistical deference.

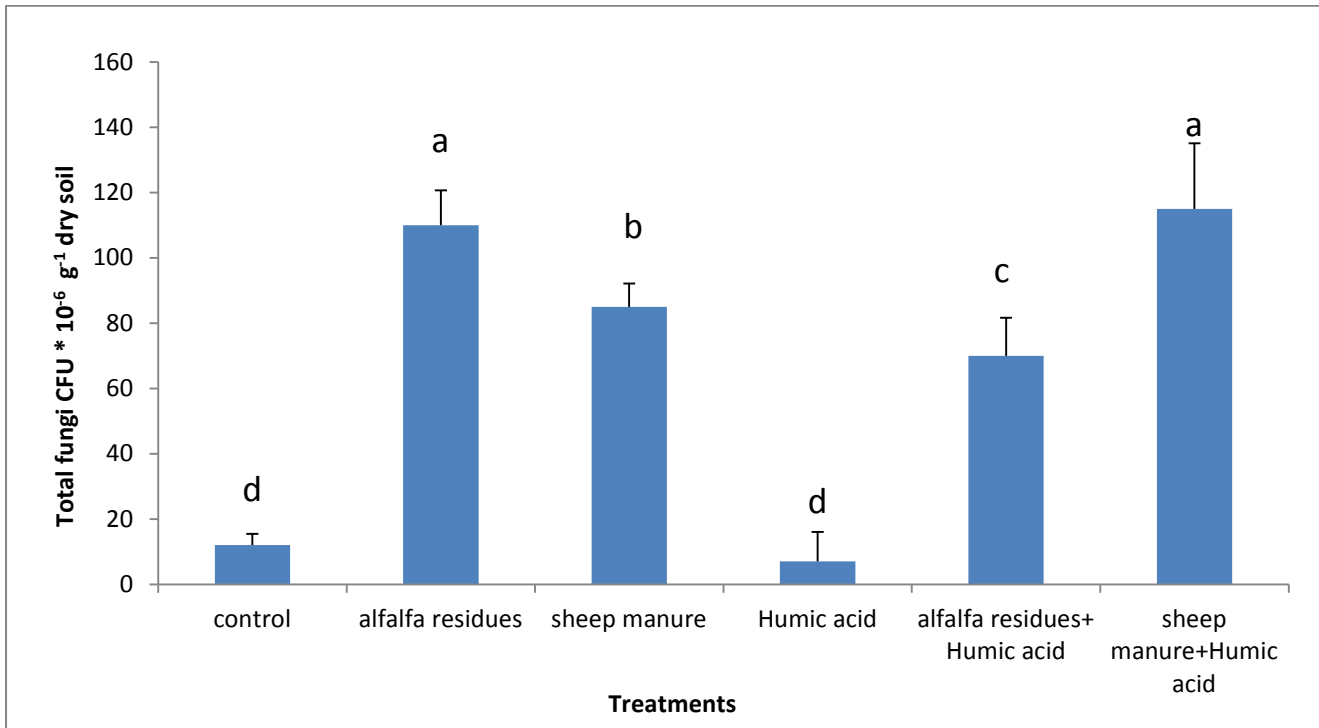


Figure 4 . Effect of treatments (control, alfalfa residues+ humic acid, sheep manure, alfalfa residues, sheep manure+humic acid and humic acid) on aggregate stability %. (Bars represent standard errors) . Different superscript letters (a, b, c, d) represent the statistical deference.

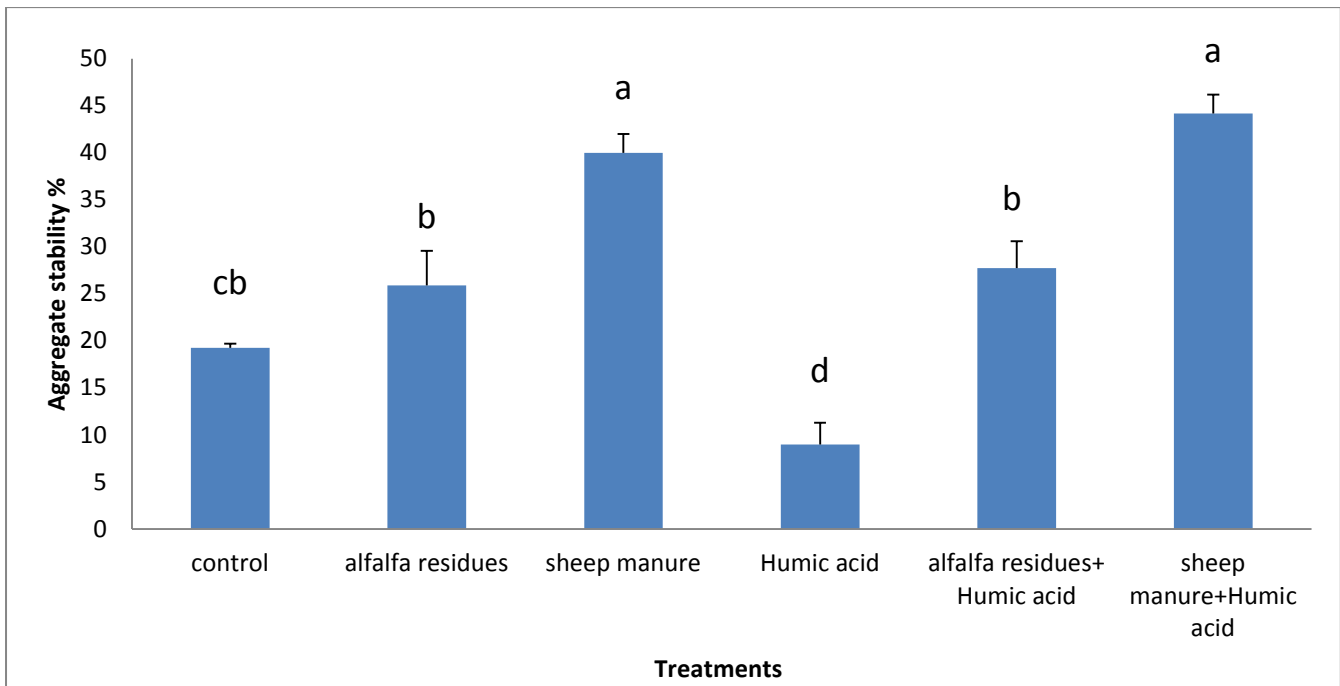


Figure 5 . Effect of treatments (control, alfalfa residues+ humic acid, sheep manure, alfalfa residues, sheep manure+humic acid and humic acid) on bulk density g/cm^3 . (Bars represent standard errors) . Different superscript letters (a, b, c, d) represent the statistical deference.

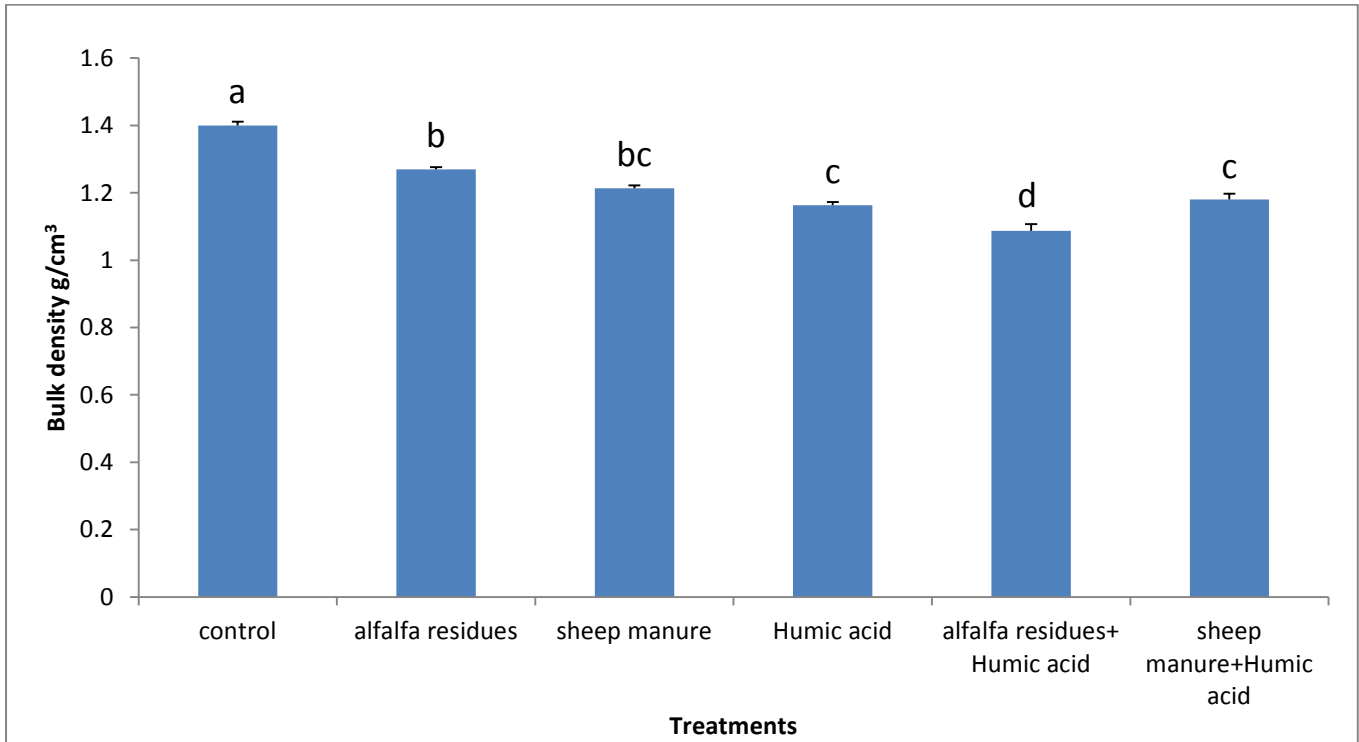


Figure 6 . Effect of treatments (control, alfalfa residues+ humic acid, sheep manure, alfalfa residues, sheep manure+humic acid and humic acid) on soil porosity %. (Bars represent standard errors). Different superscript letters (a, b, c, d) represent the statistical deference.

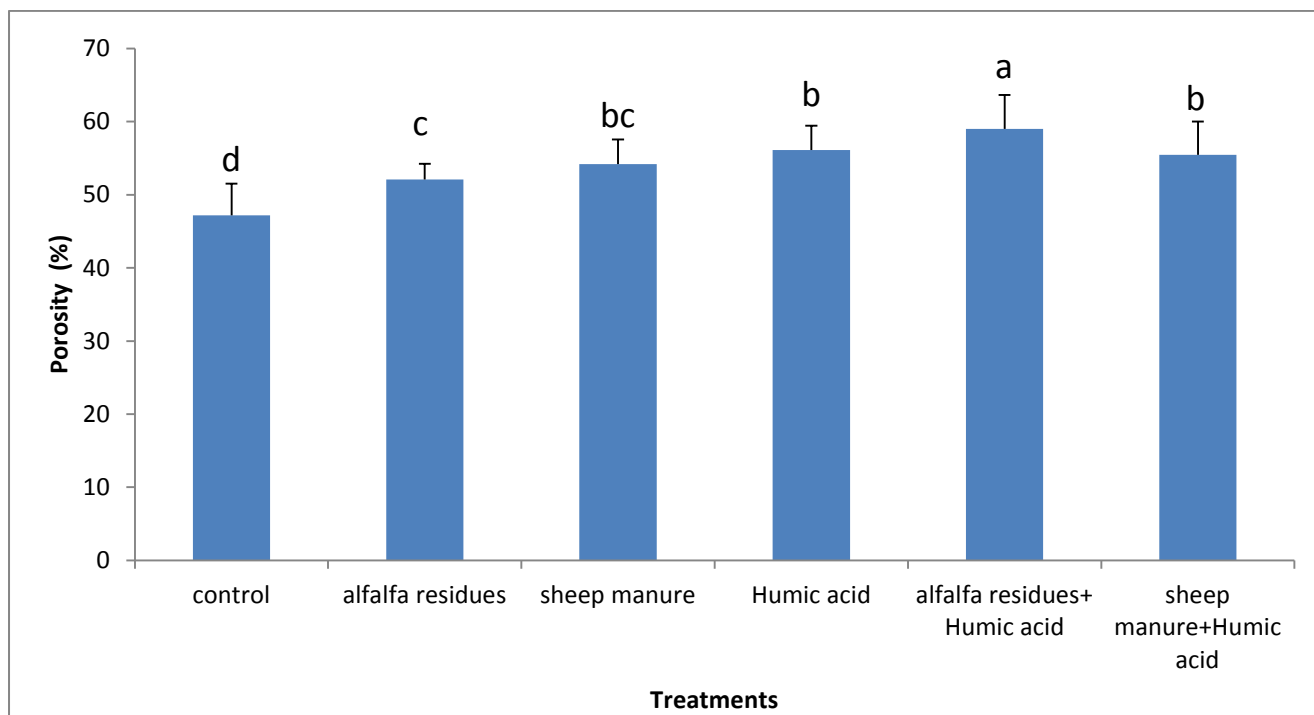


Figure 7 . Effect of treatments (control, alfalfa residues+ humic acid, sheep manure, alfalfa residues, sheep manure+humic acid and humic acid) on organic carbon%. (Bars represent standard errors). Different superscript letters (a, b, c, d) represent the statistical deference.

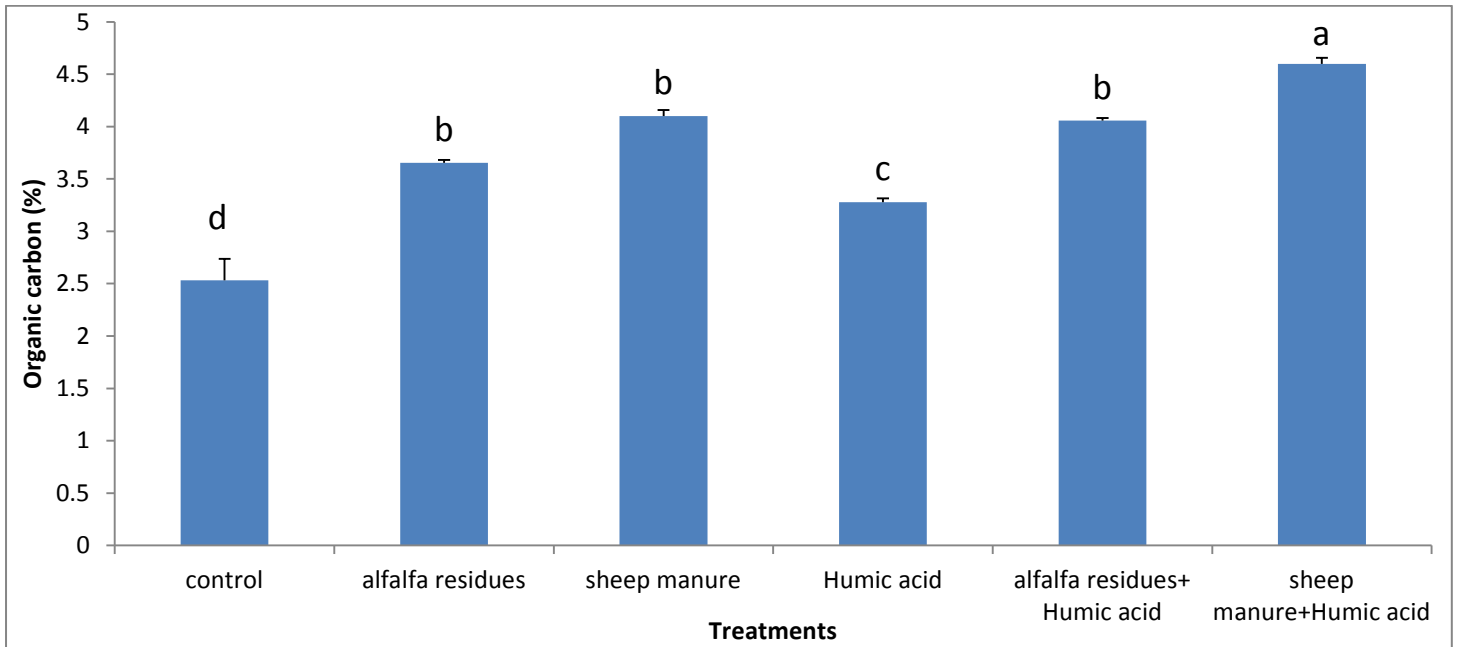


Figure 8 . Effect of treatments (control, alfalfa residues+ humic acid, sheep manure, alfalfa residues, sheep manure+humic acid and humic acid) on plant length cm. Bars represent standard errors. Different superscript letters (a, b) represent the statistical deference.

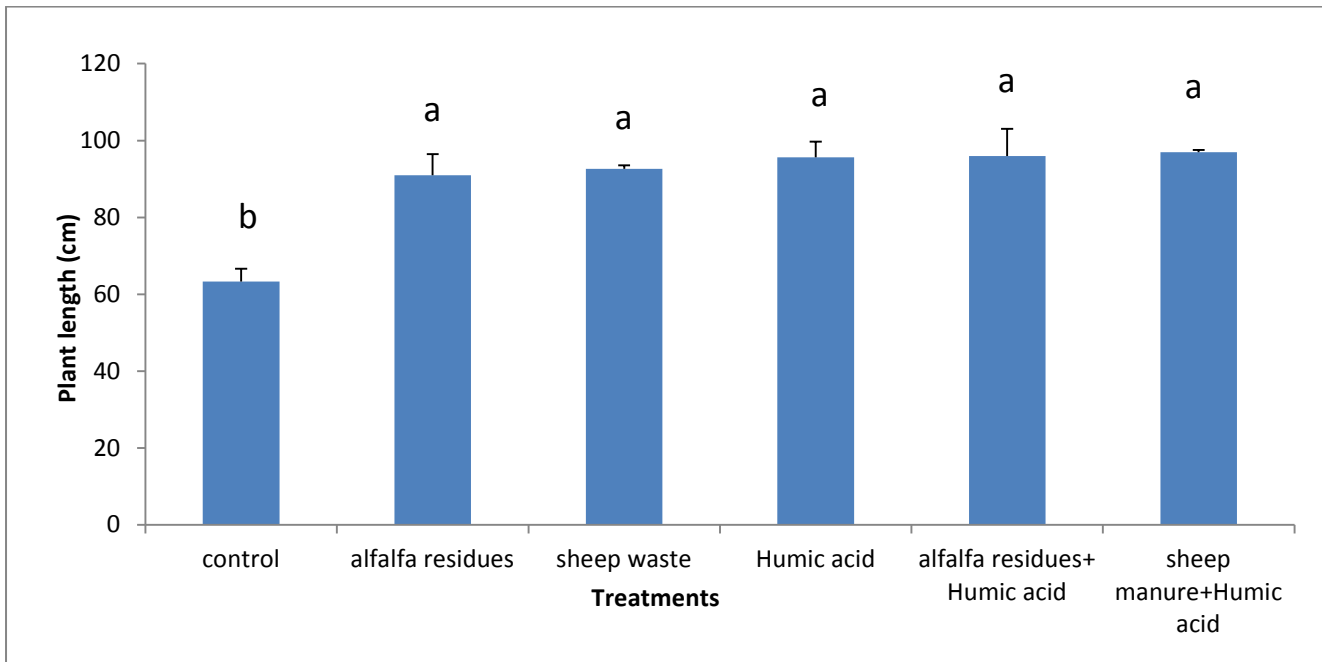


Figure 9 . Effect of treatments (control, alfalfa residues+ humic acid, sheep manure, alfalfa residues, sheep manure+humic acid and humic acid) on weight plant (g). Bars represent standard errors. Different superscript letters (a, b) represent the statistical deference.

