

Article title: Zeolite enhances the beneficial effects of sewage sludge on barley yield, increases nitrogen use, and improves soil properties

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Author names: Stergios Antonoglou · Spyridon D. Koutroubas* · Vasileios Antoniadis · Christos A. Damalas · Sideris Fotiadis · Theodoros Markopoulos

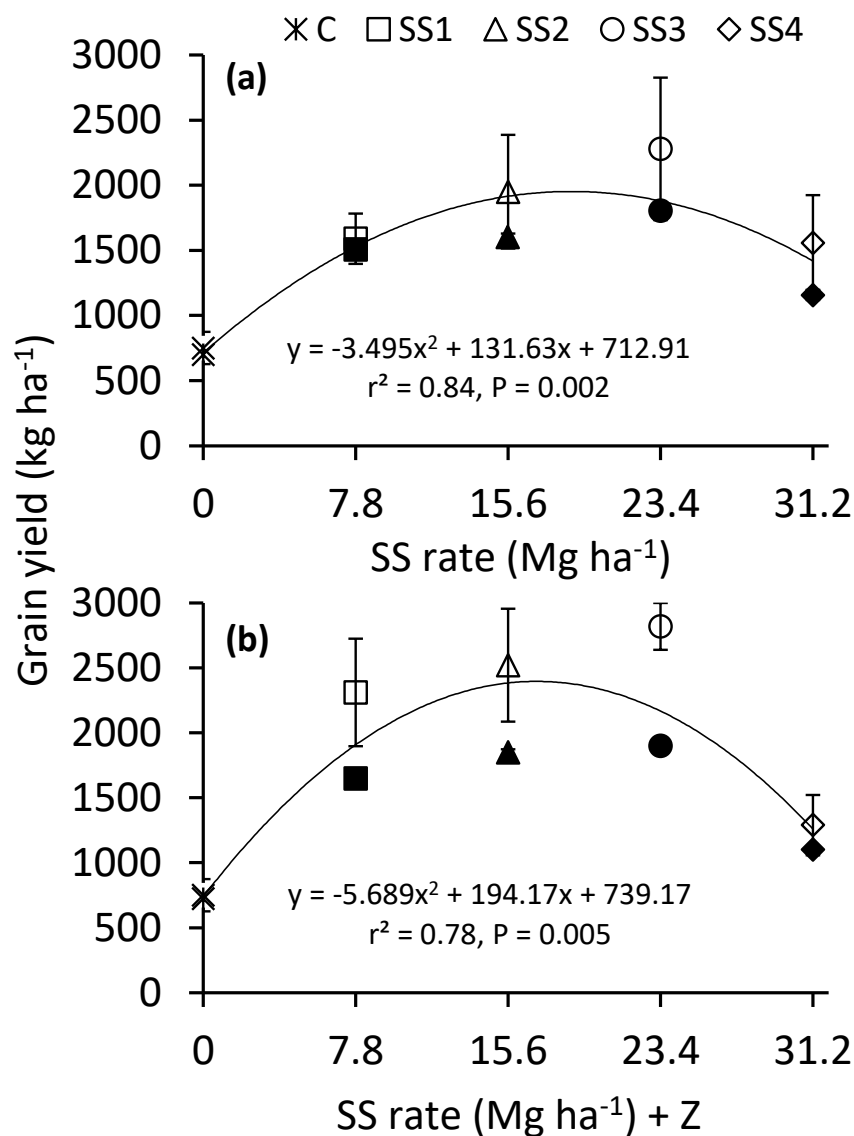
Affiliation and e-mail address of the corresponding author: Department of Agricultural Development, Democritus University of Thrace, GR-682 00 Orestiada, Greece E-mail addresses: skoutrou@agro.duth.gr (S.D. Koutroubas); chris.damalas@yahoo.gr (C.A. Damalas)

Supplementary Table ST1

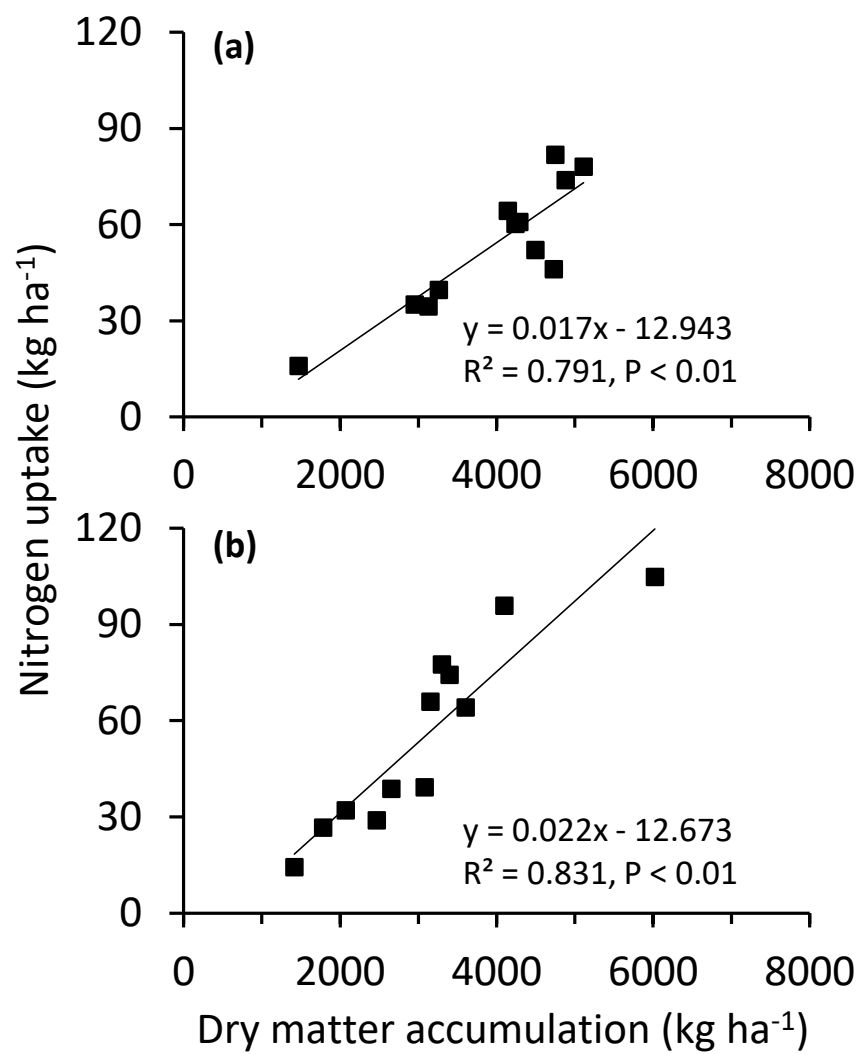
Effects of sewage sludge and inorganic fertilizer applied either alone or in combination with zeolite on soil diethylenetriamine pentaacetic acid (DTPA)-extractable concentration of Mn and Cu after barley harvest

and Cu after barley harvest					
Treatment		Mn-DTPA (mg kg ⁻¹)		Cu-DTPA (mg kg ⁻¹)	
				2017	2018
Control		12.17		0.32	0.55
Fertilizer (IF)		10.75		0.27	0.56
SS1		12.13		0.31	0.63
SS2		13.31		0.29	0.68
SS3		9.64		0.33	0.66
SS4		10.51		0.22	0.62
Zeolite (Z)		11.28		0.22	0.63
IF + Z		10.67		0.27	0.48
SS1 + Z		9.35		0.18	0.58
SS2 + Z		15.02		0.31	0.66
SS3 + Z		11.85		0.28	0.52
SS4 + Z		11.56		0.27	0.55
Mean		11.519		0.270 b	0.593 a
Source of variation	df	F	P > F	F	P > F
Year (Y)	1	0.296	0.984	250.922	<0.001
Treatments (T)	11	1.595	0.120	1.708	0.091
Y × T	11	1.905	0.054	1.372	0.207

Values of Mn-DTPA are means of 2017 and 2018. Yearly means followed by the same letter do not differ significantly at the 0.05 probability level. IF: inorganic fertilizer applied at 120 kg N ha⁻¹ and 26.16 kg P ha⁻¹; SS: sewage sludge applied at 7.8 Mg ha⁻¹ (SS1), 15.6 Mg ha⁻¹ (SS2), 23.4 Mg ha⁻¹ (SS3), and 31.2 Mg ha⁻¹ (SS4); Z: natural zeolite applied at 1.14 Mg ha⁻¹



Supplementary Figure SF1 Relationship between sewage sludge (SS) rate applied either (a) alone or (b) in combination with natural zeolite (Z) and grain yield of barley. Sewage sludge applied at 7.8 Mg ha⁻¹ (SS1), 15.6 Mg ha⁻¹ (SS2), 23.4 Mg ha⁻¹ (SS3), and 31.2 Mg ha⁻¹ (SS4) over two years (2017, open symbols; 2018, filled symbols); Zeolite applied at 1.14 Mg ha⁻¹



Supplementary Figure SF2 Relationship between dry matter accumulation and nitrogen uptake by barley at anthesis (a) 2017 and (b) 2028. Each relationship was based on means derived from twelve treatments (n = 12)