

Evaluating Soil Amendments Manufactured with Coal Combustion Ash on Soil Quality and Crop Growth

Hyun-Soo Yun¹. Se-Jin Oh¹. Sang-Pil Lee¹. Sung-Chul Kim². Jae E. Yang^{1*}

¹Department of Biological Environment, Kangwon National University, Chuncheon, Korea

² Department of Bio-Environmental Chemistry, Chungnam National University, Daejeon, Korea

*Corresponding author: Jae E. Yang, yangjay@kangwon.ac.kr

Introduction

- Soil amendments can be utilized to **improve soil properties and fertility** resulting enhancement of crop production.
- Coal ash is a by-product of coal combustion and contains **minerals and micro nutrients (Ca, K, Mg etc)** that are necessary for crop growth.
- Production of coal ash has been increased recently in Korea because of high demand of electricity but **recycle efficiency of coal ash is very low.**



Objective

Utilizing Coal Ash for Soil Amendment in Agricultural Field and Evaluating efficiency of Manufactured Amendments for Crop Growth

Materials & Methods



Figure 1. Process of manufacturing soil amendment

Table 1. Applied amount of soil amendment for tomato and hot pepper

Plants	Treatments	Fertilizer manufacture	Amount of applied fertilizer
Tomato (<i>Lycopersicon esculentum</i> MILL.)	FCA 1	Coal ash : CaOH ₂ : Bentonite = 3 : 6 : 1	N, P, K + 200 kg 10 ⁻¹
	FCA 2		N, P, K + 400 kg 10 ⁻¹
	CMA 1	Dolomitic limestone	N, P, K + 200 kg 10 ⁻¹
Hot pepper (<i>Capsicum L. var. annum.</i>)	Control	Untreated control plot	N, P, K
	CMA1	Dolomitic limestone	N, P, K + 200 kg 10 ⁻¹
	FCA 1	Coal ash : CaOH ₂ : Bentonite = 3 : 6 : 1	N, P, K + 200 kg 10 ⁻¹
	FCA 2		N, P, K + 400 kg 10 ⁻¹
	FA 1	Coal ash : Bentonite = 9 : 1	N, P, K + 200 kg 10 ⁻¹
	FA 2		N, P, K + 400 kg 10 ⁻¹

Results

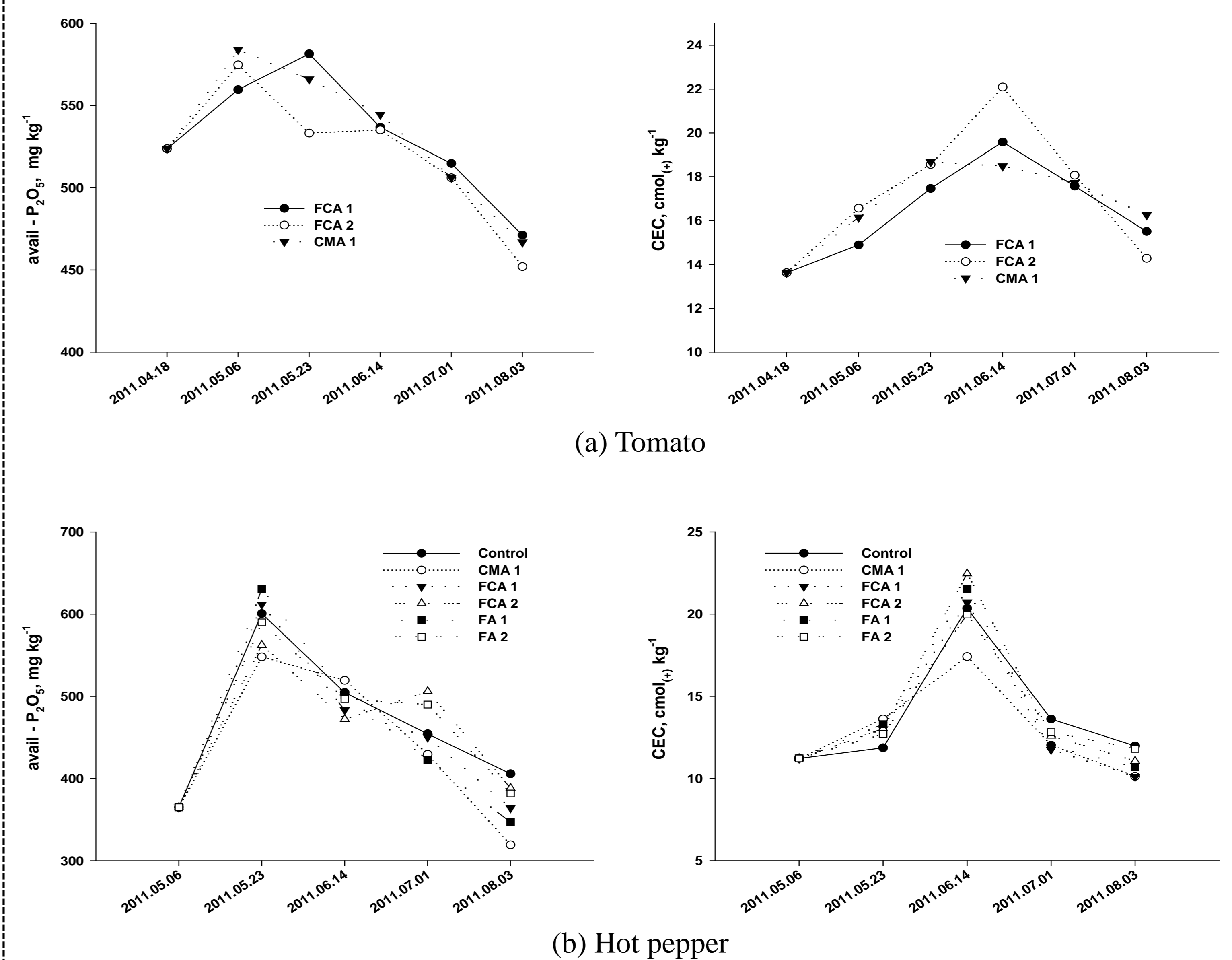


Figure 2. Result of chemical properties in soil applied with amendments

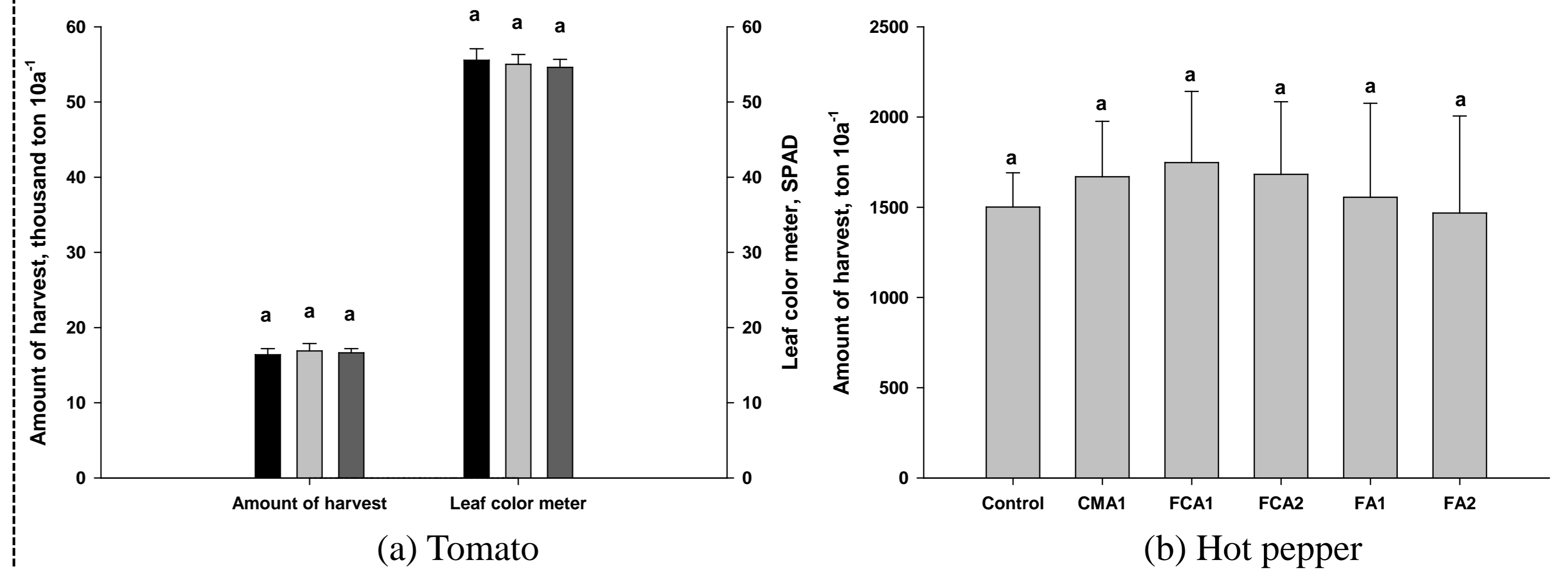


Figure 3. Harvest amount, chlorophyll of Crops

Table 2. Heavy metal concentration in tomato and hot pepper with different treatments

Plants	Treatments	Cd	Cu	Pb	Ni	Zn	As
Tomato	FCA 1	N.D*	8.18 a	N.D	11.60 a	19.16 a	N.D
	FCA 2	N.D	8.65 a	N.D	12.25 a	17.86 a	N.D
	CMA 1	N.D	13.44 a	N.D	11.03 a	19.04 a	N.D
Hot pepper	Control	N.D	9.39 a	1.09 a	2.48 c	24.89 a	N.D
	CMA1	N.D	10.17 a	1.25 a	3.57 ab	23.84 a	N.D
	FCA 1	N.D	9.85 a	1.40 a	3.76 ab	23.67 a	N.D
	FCA 2	N.D	8.80 a	1.31 a	4.57 a	22.45 a	N.D
	FA 1	N.D	9.04 a	1.08 a	3.31 bc	24.61 a	N.D
	FA 2	N.D	9.07 a	1.45 a	3.47 bc	23.35 a	N.D

Conclusion

- Although statistical analysis showed that no significant difference between coal ash amendments and conventional fertilizer in terms of crop growth, **higher crop growth was observed when usage of coal ash amendment and control were compared.**
- Heavy metal concentration in soil** applied with coal ash amendment showed **no significant difference** compared to control and conventional fertilizer
- Coal ash can be utilized for soil amendment in agricultural field and no adverse effect is expected**

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