

Supplementary material

Title: Interactive effect of biochar and potassium-solubilizing bacteria on soil depth-dependent potassium dynamics, enzymatic activities and bacterial community in acidic soil under irrigation practices

Saba Babar^a, Amanullah Baloch^b, Muhammad Qasim^a, Jiyuan Wang^a, Khurram Shehzad^c, Mohammed S. Alotaibi^d, Usman Zulfiqar^e, Cuncang Jiang^{a*}, Mayank Anand Gururani^{f*}

^aMicroelement Research Center, College of Resources and Environment, Huazhong Agricultural University, Wuhan, Hubei, 430070, P.R. China

^bNational Key Laboratory of Crop Genetic Improvement and College of Plant Science and Technology, Huazhong Agricultural University, Wuhan 430070, P.R. China

^cHubei Key Laboratory of Soil Environment and Pollution Remediation, College of Resources and Environment, Huazhong Agricultural University, Wuhan 430070 (China)

^dDepartment of Clinical Laboratories Sciences, Turabah University College, Taif University, Taif 21995, Saudi Arabia

^eDepartment of Agronomy, Faculty of Agriculture and Environment, The Islamia University of Bahawalpur, Bahawalpur 63100, Pakistan

^fDepartment of Biology, College of Science, United Arab Emirates University, Al Ain, United Arab Emirates.

*Corresponding author: jcc2000@mail.hzau.edu.cn, gururani@uaeu.ac.ae

Authors email

Saba Babar: sabababar71@gmail.com

Amanullah Baloch: amanullahbaloch@webmail.hzau.edu.cn

Muhammad Qasim: qrajput64@gmail.com

Jiyuan Wang: wangjy11@webmail.hzau.edu.cn

Khurram Shehzad: khurramshehzad1993@webmail.hzau.edu.cn

Mohammed S. Alotaibi: m.s.alotaibi@tu.edu.sa

Usman Zulfiqar: usman.zulfiqar@iub.edu.pk

Cuncang Jiang: jcc2000@mail.hzau.edu.cn

Mayank Anand Gururani: gururani@uaeu.ac.ae

28 **Table S1.** Basic chemical properties of soil and rice straw biochar (BC) before experimentation.

Parameters	Soil	Parameters	BC
pH	5.20	pH	9.60
Available P (mg kg ⁻¹)	7.38	C (%)	46.29
Available K (mg kg ⁻¹)	103	N (%)	0.85
Soil organic matter (g kg ⁻¹)	5.42	K (%)	1.11
Soil hydrolysable N (mg kg ⁻¹)	31.8	Ca (%)	0.64

29

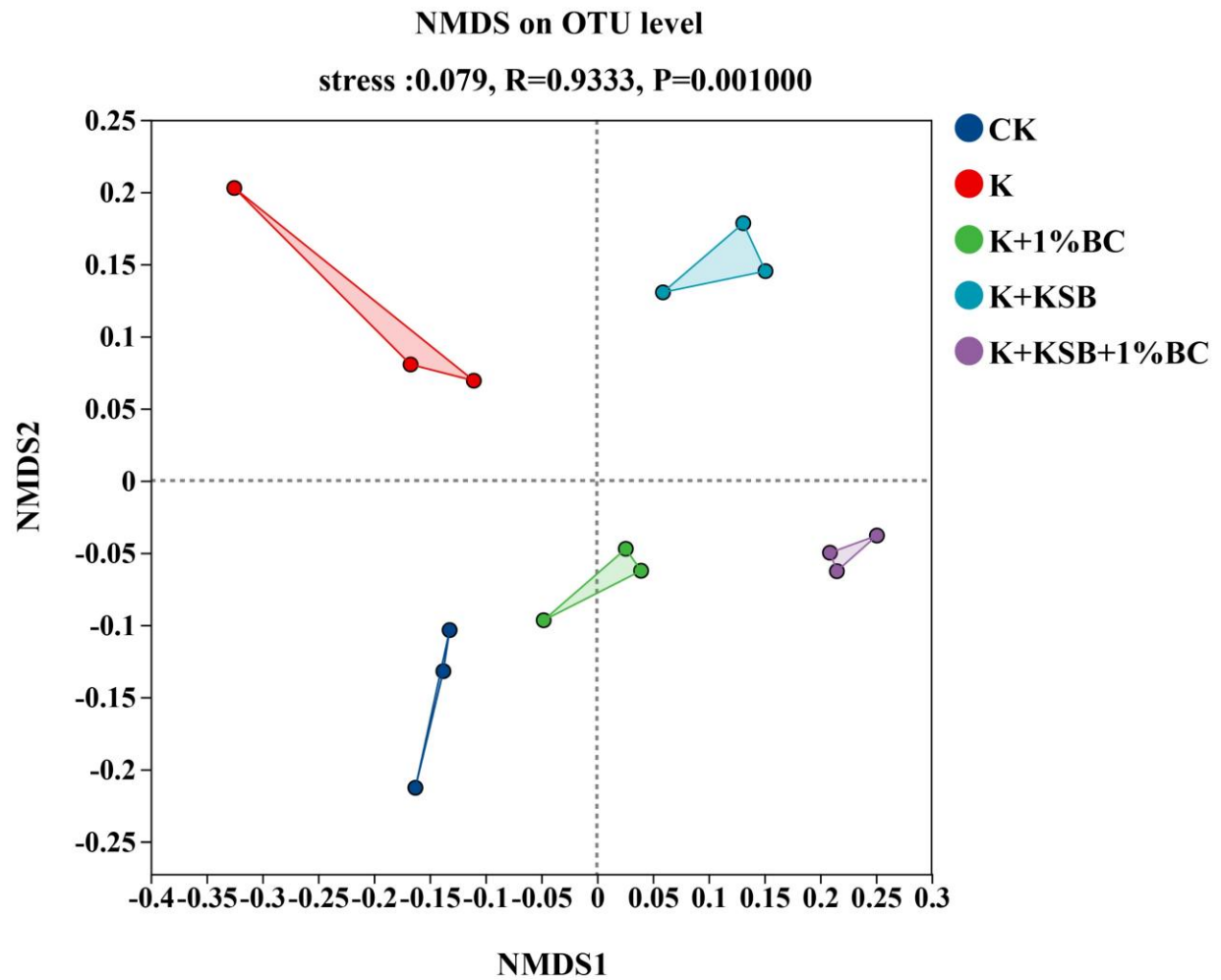


Fig. S1 NMDS analysis based on OTU composition depicted a distinct bacterial community composition under different treatments. Points represent individual samples colored by each treatment group, with closer positions representing a greater similarity in community structure.

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

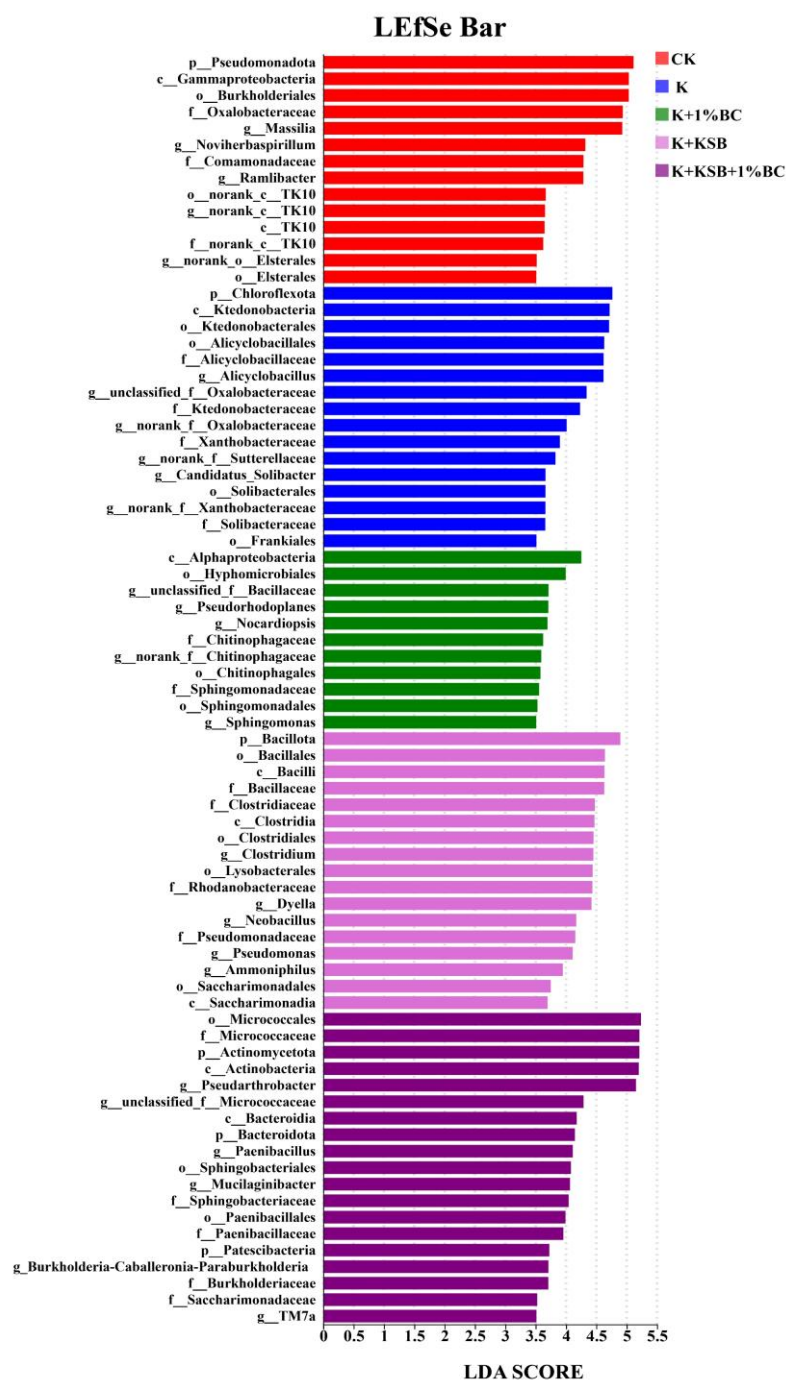
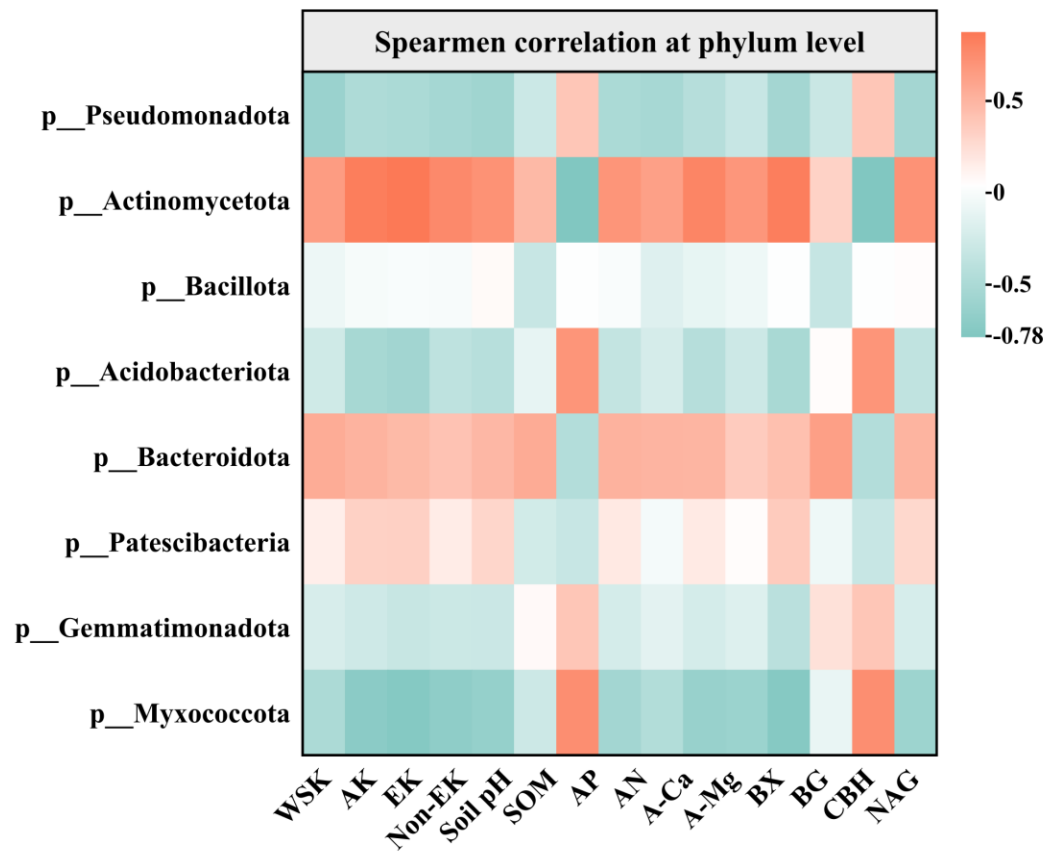


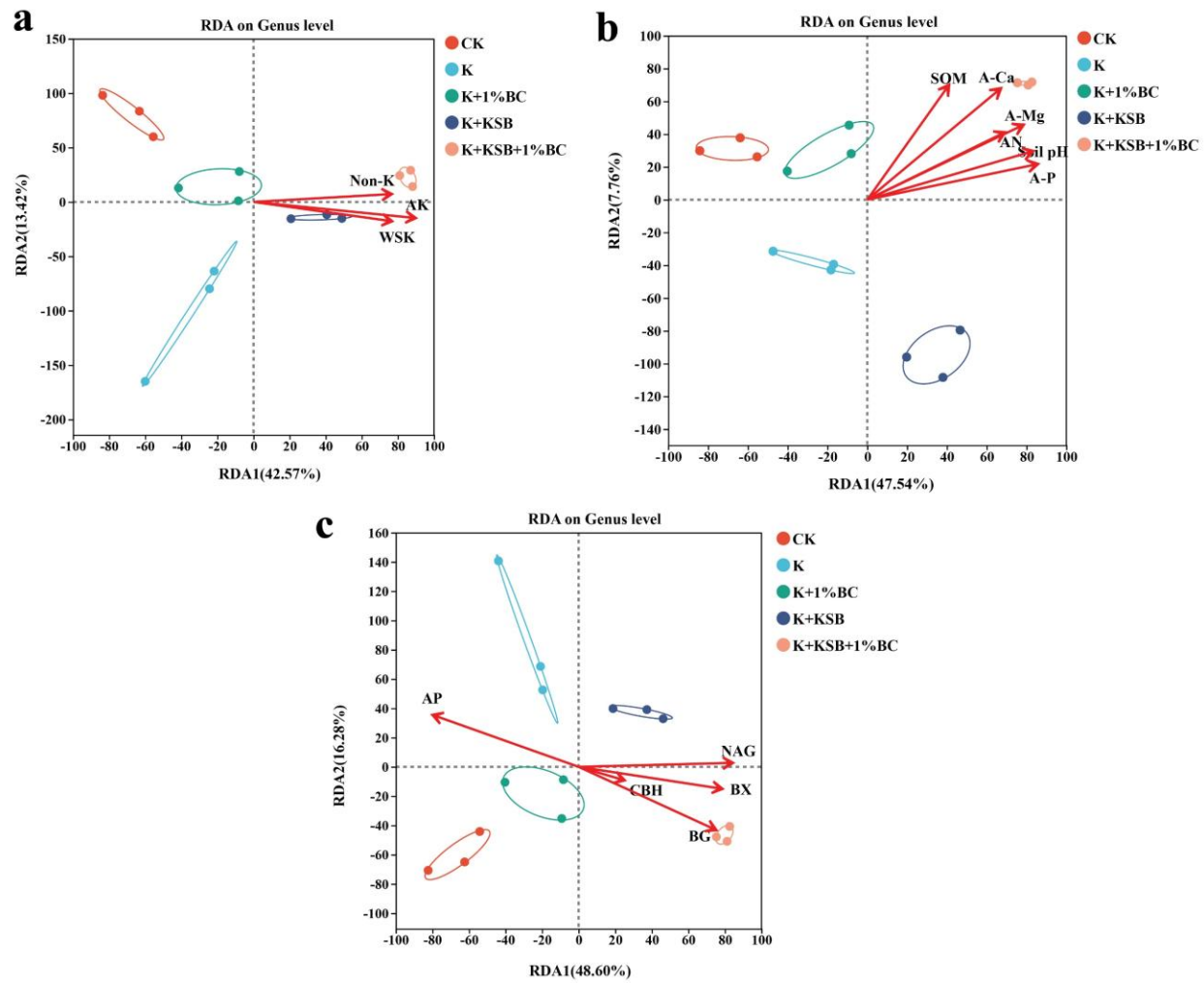
Fig. S2 LEfSe bar plot displayed the enriched bacterial taxa among treatments using Linear discriminant analysis (LDA) with a threshold score 3.5. Bar lengths represent the effect size of each taxon across different treatments.



57

58 **Fig. S3** Spearman correlation analysis displayed the relationship between soil bacterial phyla and
 59 environmental factors. The color intensity depicts the strength and direction of correlation (positive
 60 or negative).

61



62

63 **Fig S4.** Results of redundancy analysis (RDA) of soil bacterial community at genus level with soil

64 K fractions (a), available nutrients (b) and enzymatic activities (c).

65

66

67