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Heavy metal resistant bacteria (*Ochrobacterum pseudogrignonense*, AA2) strain along with the combination with biochar mitigates cadmium toxicity in sesame (*Sesamum indicum*)

Arjun Adhikari[1]*, Ko-Eun Lee[1], Sang-Mo Kang[1] and In-Jung Lee[1]

[1]School of Applied Biosciences, Kyungpook National University, Daegu 41566, Republic of Korea

[Introduction]

Heavy metal like cadmium (Cd) produced from the excessive anthropogenic human activity is extremely toxic to plant, human and aquatic life. The efficient agriculture tools to mitigate the toxicity in a plant is of great concern in the global world. Thus, to tackle this problem, application of heavy metal resistant bacteria and biochar is gaining momentum. It have been reported that the sesame is the eighth most oil producing crops and its leaves are eaten raw due its numerous medicinal values. In the present study, we investigated the effect of cadmium resistant bacteria along with the combination of biochar in sesame grown at cadmium inoculated soil.

[Materials and Methods]

For screening of heavy metal resistant bacteria, we selected ten different station on the south sea of the Republic of Korea, that are likely to be more contaminated with the heavy metals. The tolerance level of the isolate was checked in the LB media subjected with $CdCO_3$, $NiCl_2$, $CuSO_4$, $K_2Cr_2O_7$ with the level until the growth of strain completely ceases, with pH ranging from 2-9. The isolate with high tolerance level with multiple heavy metal was selected and used as inoculum for the pot experiment in sesame. The experiment was designed as control 1(C1): Distilled water, Control(C2): Cadmium, Treatment 1(T1): Cd + Bacteria, Treatment 2(T2): Cd + Biochar, Treatment 3(T3): Cd + Bacteria + Biochar. Plant harvested from the experiment designed above was used for further biochemical analysis.

[Results and Discussions]

Through screening of sludge from 10 different station of the south sea, Republic of Korea we isolated 100 different isolates. The isolate that is highly resistant to multiple heavy metal was selected and identified as *Ochrobacterum pseudogrignonense* AA2 based on the 16s rRNA gene sequence analysis. The isolate is highly resistant to Cadmium 5000uM, Copper 4000 uM, Chromium 4000 uM and Nickel 3000 uM. The isolate produced organic acid (acetic acid > tartaric acid > butyric acid > lactic acid) having a maximum growth ability at pH 7. Pot experiment revealed that the inoculation of isolate along with the black oak biochar application significantly reduced the cadmium accumulation in sesame shoot while leaving a significantly higher concentration of Cd in its root in T3. The Cd concentration of soil (C2) have significantly higher value over (C1) and treated plant. Likewise, the Calcium and Phosphorus content was found significantly higher in T4, C1 and C2 on soil, root and shoot respectively. These results suggest that the combined application of *Ochrobacterum pseudogrignonense* and biochar can be an efficient tool to mitigate the heavy metal toxicity in plants.

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*Corresponding author: Tel. +82-53-950-5708 (Office), E-mail. ijlee@knu.ac.kr