Potential of Different Poplar Clones in Phytoremediation of Some Heavy Metals

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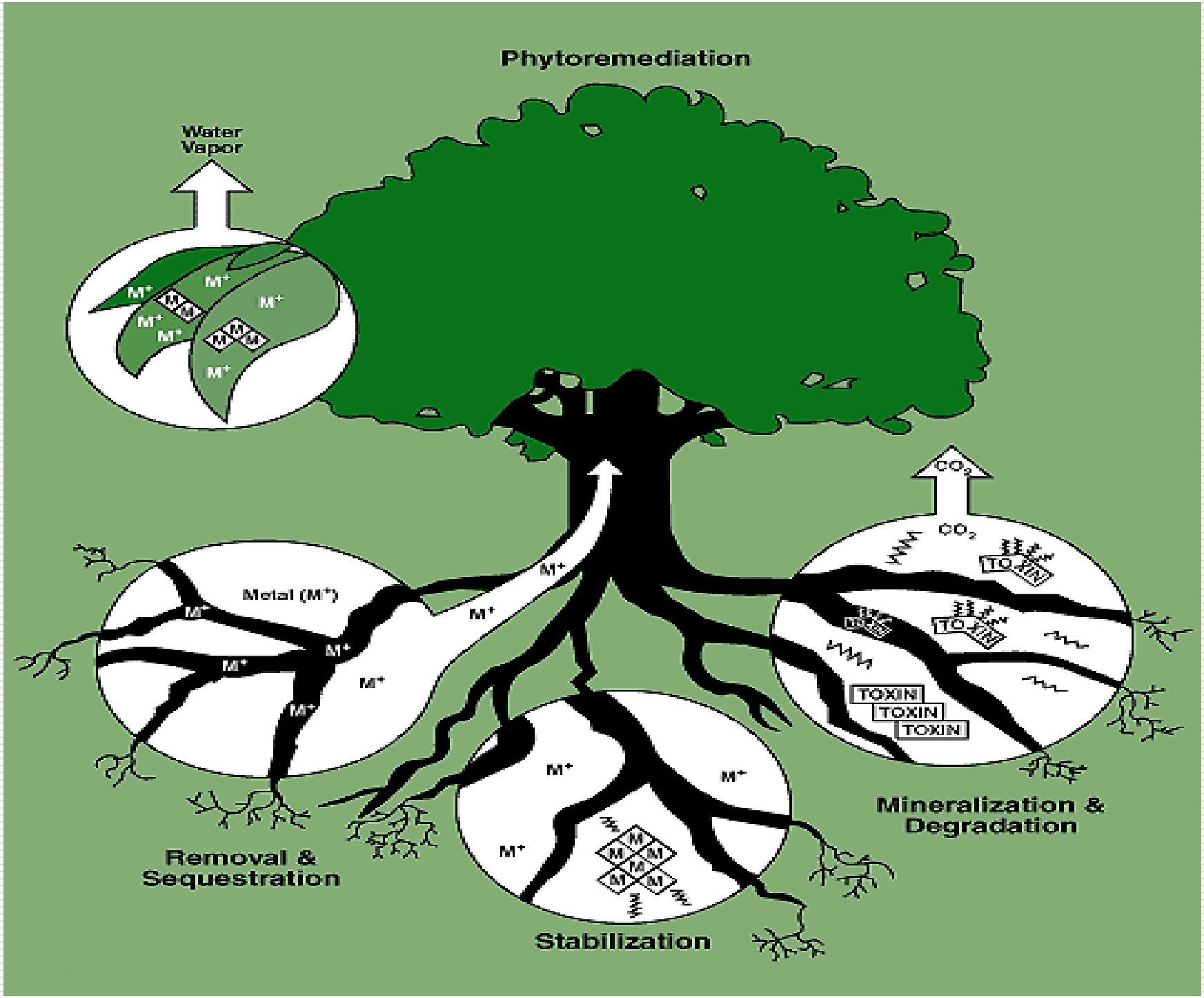

Phytoremediation
Water Vapor
M+
Metal (M+)
CO2
TOXIN
Removal & Sequestration
Stabilization
Mineralization & Degradation

Comtaminants

Cadmium

- **Chlorosis**
- **Disorder of respiration and nitrogen metabolism**
- **Growth inhibition**

Nickel

- **Microlelement**
- **Necrosis**
- **Fe defficiency**

Lead

- **Sistemic toxine**
- **binding with metaloenzymes**
- **inhibiting synthesis of proteins**
- **inhibiting synthesis of chloroplast and photosynthesis**

Previous research

Pilipović, A., Nikolić, N., Orlović, S., Petrović, N., Krstić, B. (2005) Cadmium phytoextraction potential of polar clones (*Populus spp.*). Z. Naturforsch. 60c: 247-251.

Nikolić, N.; Pilipović, A.; Orlović, S.; Krstić, B.; Pajević, S.(2005) The Potential of Poplars in Cleaninig Waters Contaminated by Cadmium. International Symposium on Danube Basin and Sustainable Development: Environment, Tourism, Legal Framework. Novi Sad, Serbia & Montenegro, 28-29 September 2005.

Nikolić, N.; Pajević, S.; Pilipović, A.; Krstić, B.; Borišev, M.; (2006) The Potential of Poplars (*Populus sp.*) in remediation of lead contaminated environment. II International Szmposium of Ecologists of Montenegro, Kotor, Montenegro, 20-24.09.2006.

Material & methods

- **Hydroponically grown cuttings of:**
  - **Populus deltoides clone 37**
  - **Populus x euramericana clone 48**
  - **(P. nigra x maximowitzii) x P. nigra var. "Italica" clone 1044,**
- **0, 10 or 100 ppm Ni, Cd or Pb**
- **135 days (45+90)**

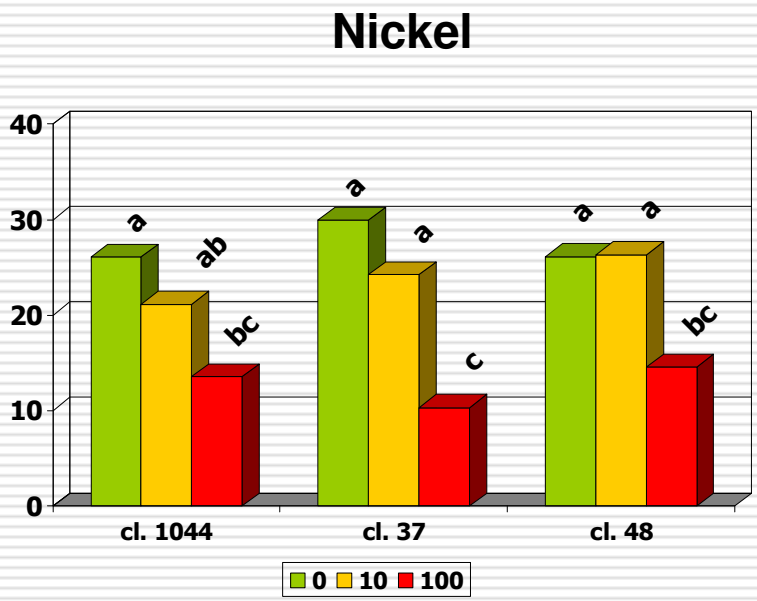
Material & methods

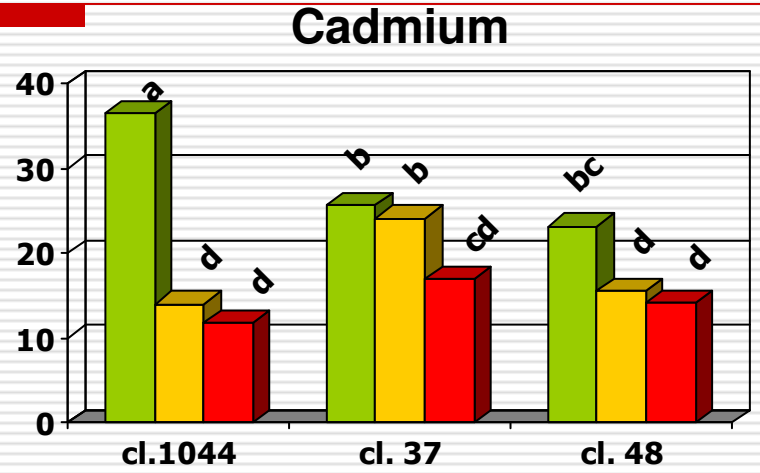
- **Investigated parameters**
  - **Biomass production**
  - **Nitrate reductase activity (NRA)**
  - **Accumulation of heavy metals in roots, leaves and stem**
- **Bioconcentration factor (Phytoextraction coefficient)**
  (Dickinson & Puloford, 2005)

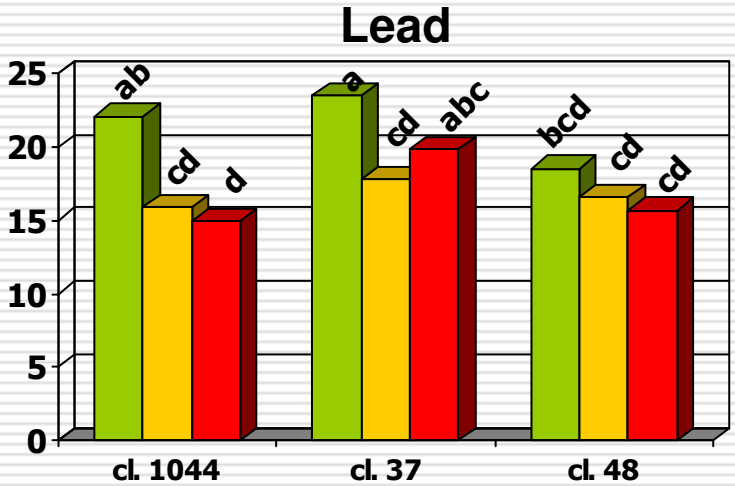
$$BCF = C_{(plant)}/C_{(medium)}$$

- **BCF = 0-1** 👎
- **BCF > 1** 👍

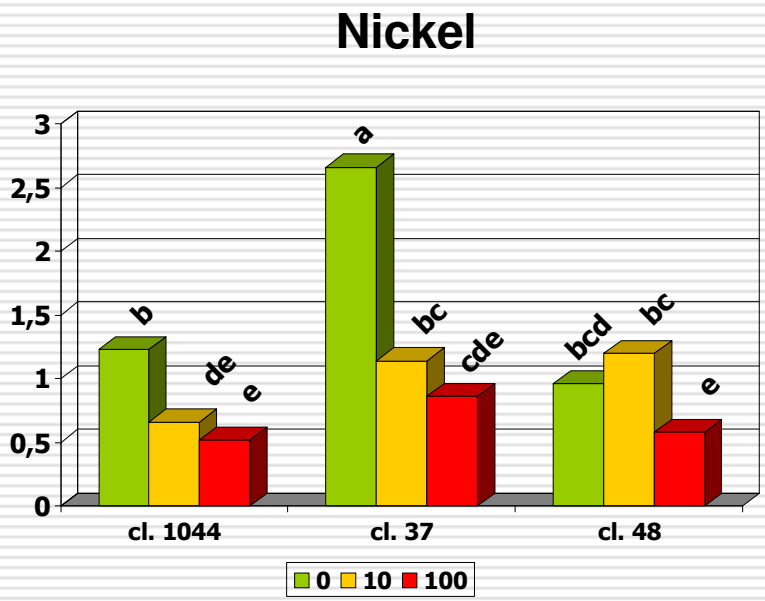
Biomass production M (g_{DW})

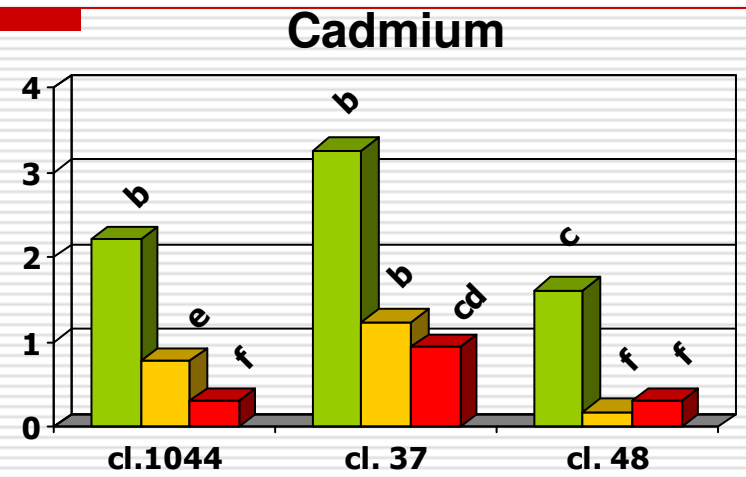


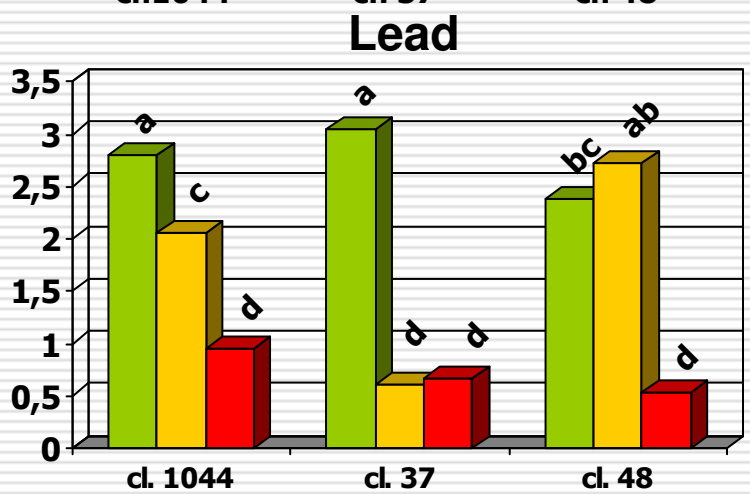




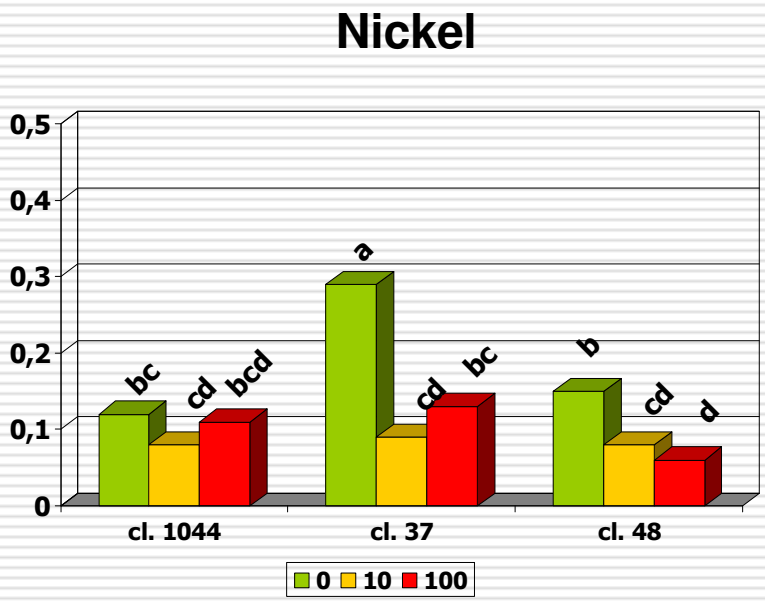
NRA in leaves (µmol $NO_2 g^{-1}_{DW} h^{-1}$)

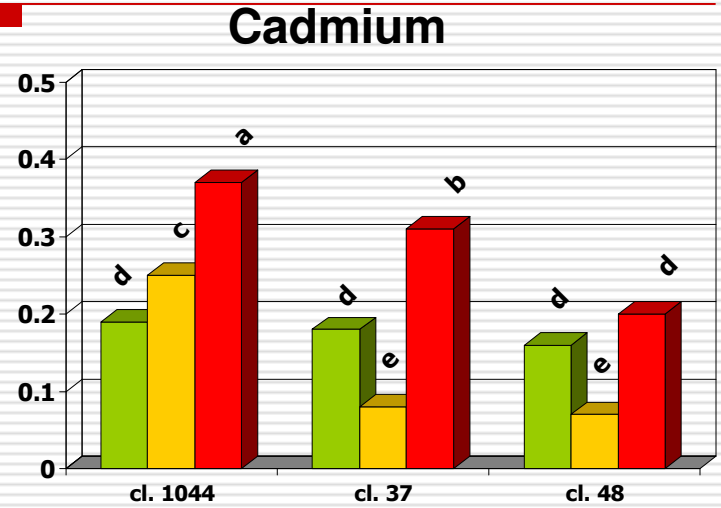


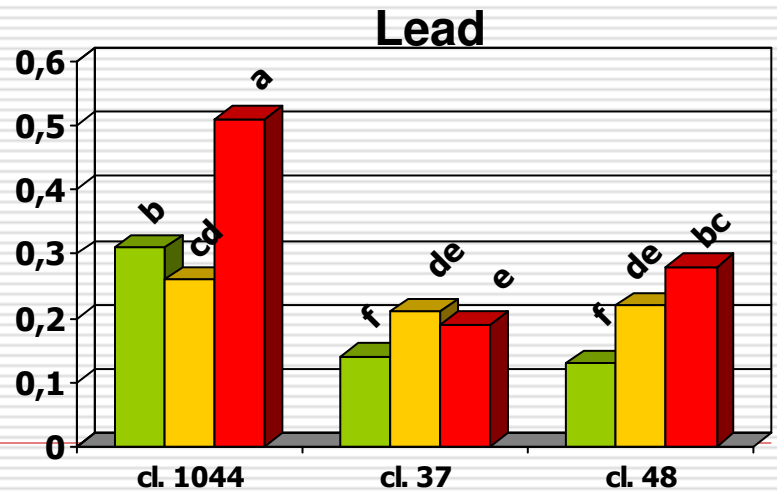


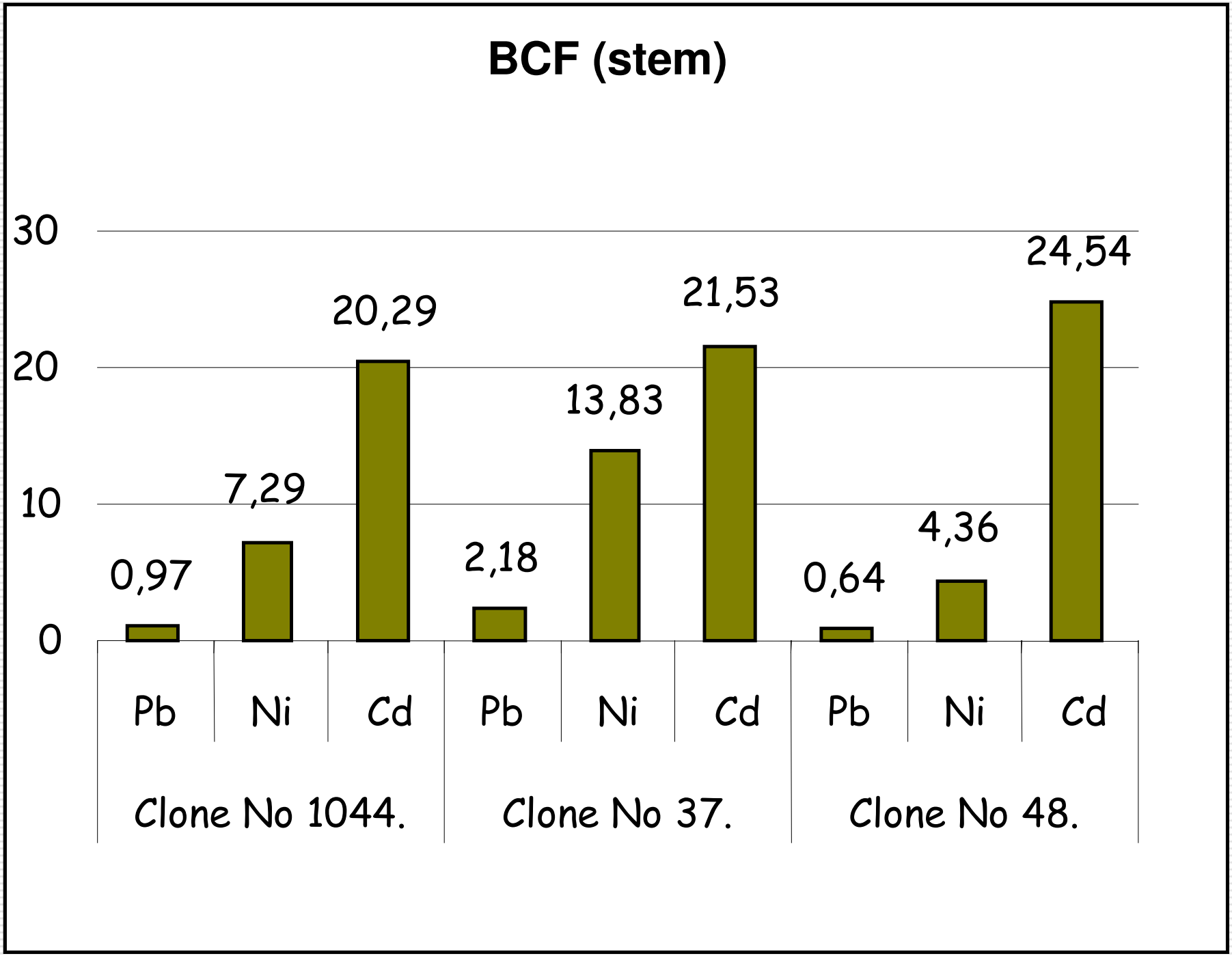


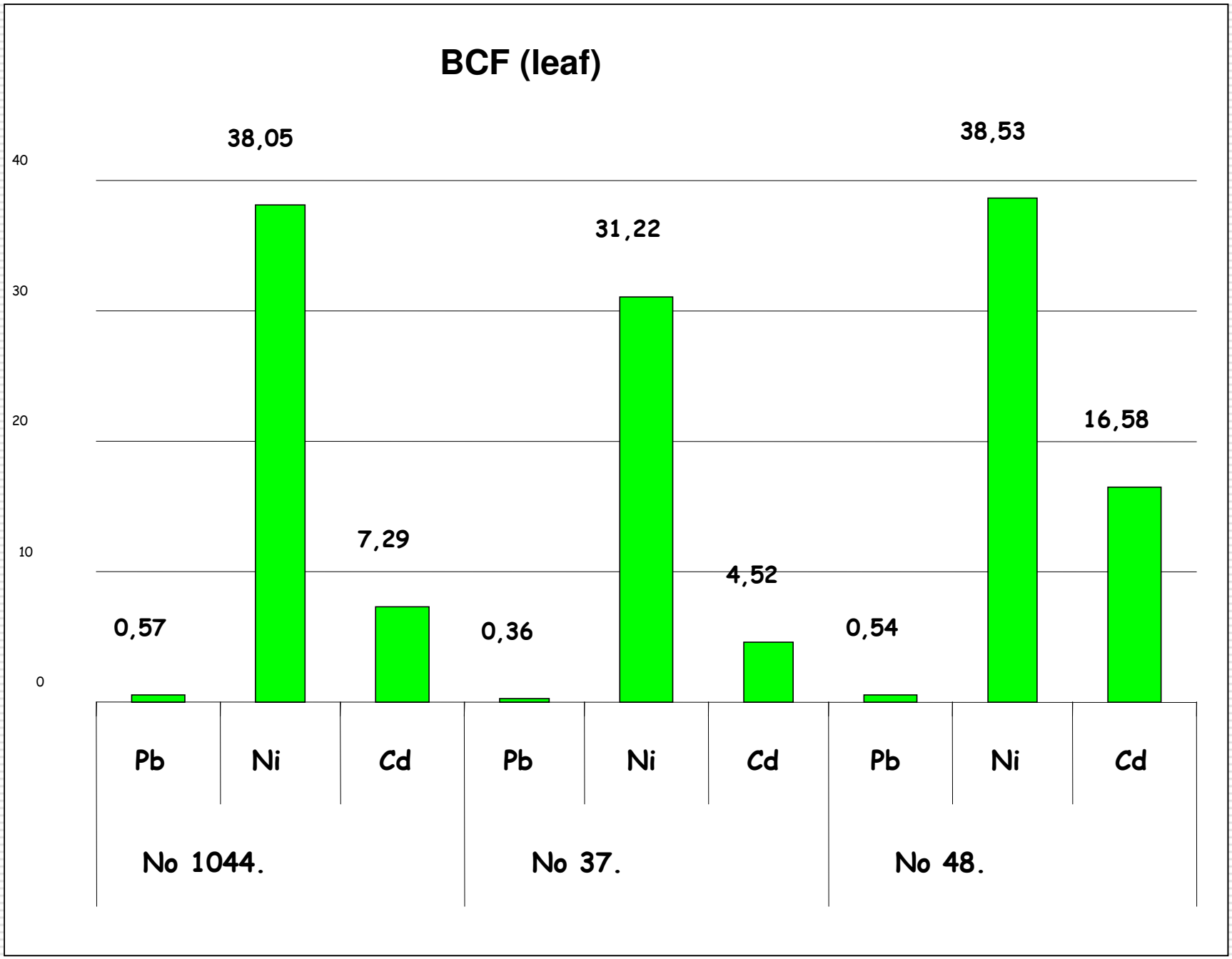
NRA in Roots (µmol $NO_2 g^{-1}_{DW} h^{-1}$)

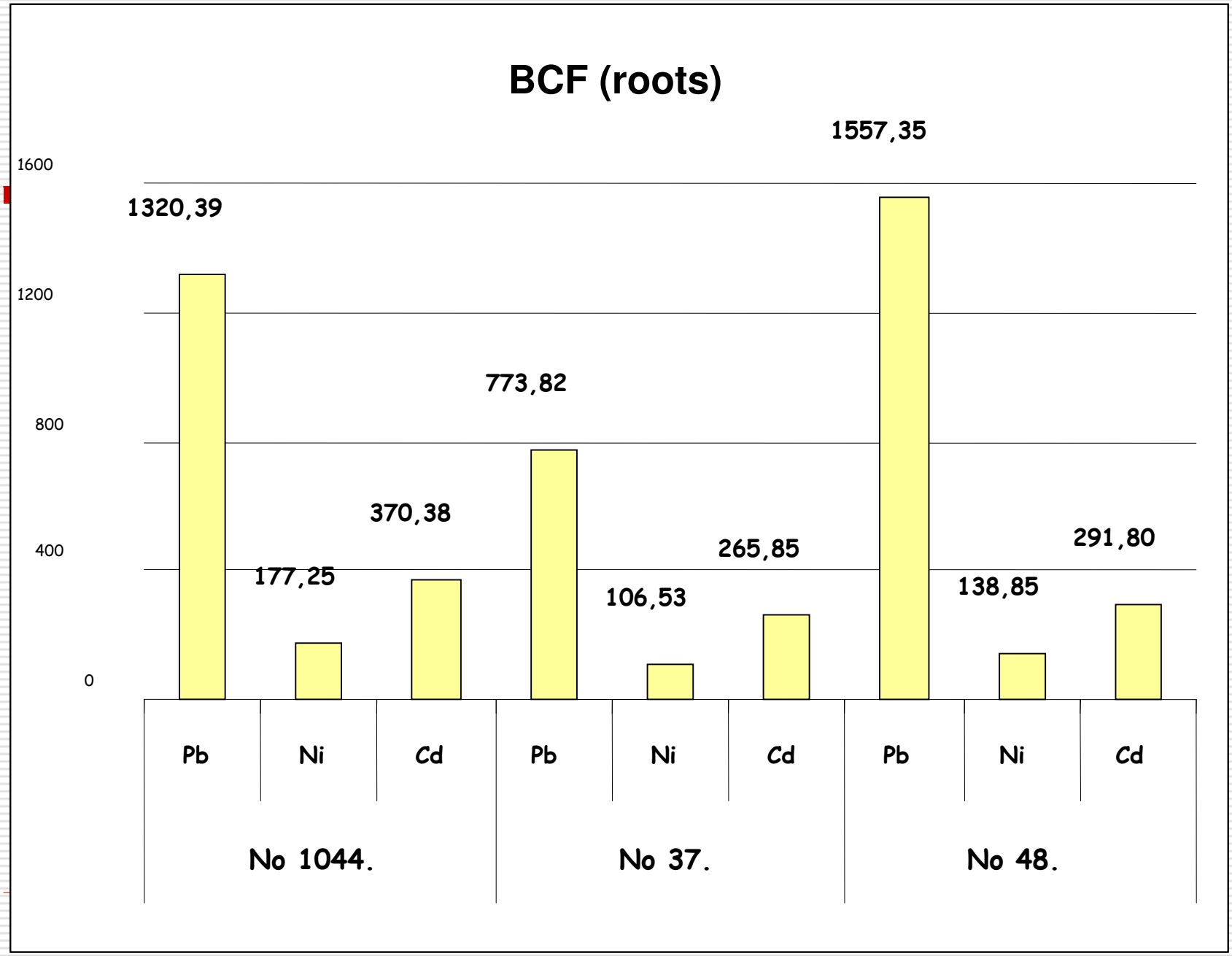







BCF (stem)
30
20
10
0
0,97
7,29
20,29
2,18
13,83
21,53
0,64
4,36
24,54
Pb
Ni
Cd
Pb
Ni
Cd
Pb
Ni
Cd
Clone No 1044.
Clone No 37.
Clone No 48.


BCF (leaf)
40
30
20
10
0
38,05
7,29
0,57
31,22
4,52
0,36
38,53
16,58
0,54
Pb
Ni
Cd
Pb
Ni
Cd
Pb
Ni
Cd
No 1044.
No 37.
No 48.


BCF (roots)
1600
1200
800
400
0
1320,39
177,25
370,38
773,82
106,53
265,85
1557,35
138,85
291,80
Pb
Ni
Cd
Pb
Ni
Cd
Pb
Ni
Cd
No 1044.
No 37.
No 48.

Conclusions

- Biomass production was affected by presence of heavy metals
- NRA was affected at highest concentrations
- Cd phytoextraction → stem
- Ni phytoextraction → leaves
- Pb phytoextraction → roots
- Stem of clone 37 is suitable for phytoextraction of Ni and Pb
- Leaves of clone 48 have high BCF of Cd

Thank you for your attention!!!