USING NATIVE AFRICAN SPECIES TO SOLVE AFRICAN WASTEWATER CHALLENGES: AN IN-DEPTH STUDY OF TWO VETIVER GRASS SPECIES

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What we know and the challenges

- Wastewater management challenge is a global issue (Plate 1&2) (UNEP, 2010 and Kumar 2011).
- Most industrial effluents in Sub Sahara Africa are discharged into environment untreated.
- Settling pond popular in wastewater management in Africa (Nikiema et al., 2013)
- Conventional treatment technologies are very limited and climate change is impacting.
What we know and the challenge

- South Indian *spp* is effective in wastewater treatment (Truong and Hart, 2001; Truong, *et al.*, 2006).
- Three *spp* of vetiver grass are known (Truong *et al.*, 2006).
- All known *spp* of vetiver have different potentials, some for erosion control as in plate 3. (Truong *et al.*, 2008).
- Use of vetiver in Africa is not common and still at its infancy (Babalola, *et al.*, 2007; Oku, 2011).

Plate 3 shows *Chrysopogon zizanioides* (A) and *Chrysopogon nemoralis* (B)
(Source: www.vetiver.org)
What we do not know

• The effectiveness of African *spp* in removing contaminants in wastewater.

Objective

• To study the effectiveness of African *spp* in wastewater treatment and compare with well known South Indian *spp*.
Methodology

- Effluents collected from quarry site, fertilizer company and untreated public dump site.

- Vetiver raised hydroponically for root and shoot establishment.

- Floating raft with established vetiver immersed in effluents as in Plate 4 (Truong et al., 2008).

Plate 4 Set-up with South Indian *spp* (4A) and African *spp* (4B) floating in effluent from fertilizer company.
Methodology

• Pre- and post-treatment contaminants determined included, heavy metals, pH, BOD, COD (FEPA, 1991; APHA, 2001; WHO, 1989; and Udo et al., 2011).
• Treated effluents collected after 2, 4 and 6 days for laboratory analysis.
• Contaminant levels compared with safe levels by FAO/WHO.
Results and Discussion

PTL = pre-treatment, contaminant levels, DAT = days after treatment; AL = allowable limit

Fig 1: Pre level and post-treatment, nitrate removal rate in public dump untreated leachate in Abakaliki, Nigeria.
PTL = pre-treatment, contaminant levels, DAT = days after treatment; AL = allowable limit

Fig 2: Pre-level and post-treatment phosphate removal rate in public dump untreated leachate in Abakaliki, Nigeria.
PTL = pre-treatment, contaminant levels, DAT = days after treatment; AL = allowable limit

Fig 3: Pre level and post-treatment, Cd removal rate in fertilizer industry effluent in Abakaliki, Nigeria.
PTL = pre-treatment, contaminant levels, DAT = days after treatment; AL = allowable limit

Fig 4: Pre and post-treatment, pH levels in quarry effluent collected in a city in Abakaliki, Nigeria.
PTL = pre-treatment, contaminant levels, DAT = days after treatment; AL = allowable limit

Fig 5: Pre and post-treatment, Pb levels in quarry effluent in Abakaliki, Nigeria.
Conclusion

• African *spp* of vetiver grass is as good as South Indian *spp*.
• African *spp* was more effective in removing phosphate while, South Indian *spp* was more effective on nitrate.
• Both *spp* improved pH.
• Both *spp* should be combined where possible for maximum industrial benefit.
• Africa can rely on its endemic *spp* for commercial and micro scale wastewater treatment.
• Production of hybrid of the two *spp* is needed.
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Thank you

Questions!!!