Engineered Constructed Wetland for Treating Domestic Wastewater

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DBT funded project
on
“Integrating bio-treated wastewater reuse with enhanced water use efficiency to support the green economy in EU and India (India Side) – Water4crops”

UAS, DHARWAD CENTER

Objectives:

1. To study the effect of ECWL on water quality

2. To evaluate the performance of Macrophytes / hydrophytes (*Typha latifolia* and *Bracharia mutica*) on water quality of the wastewater treated

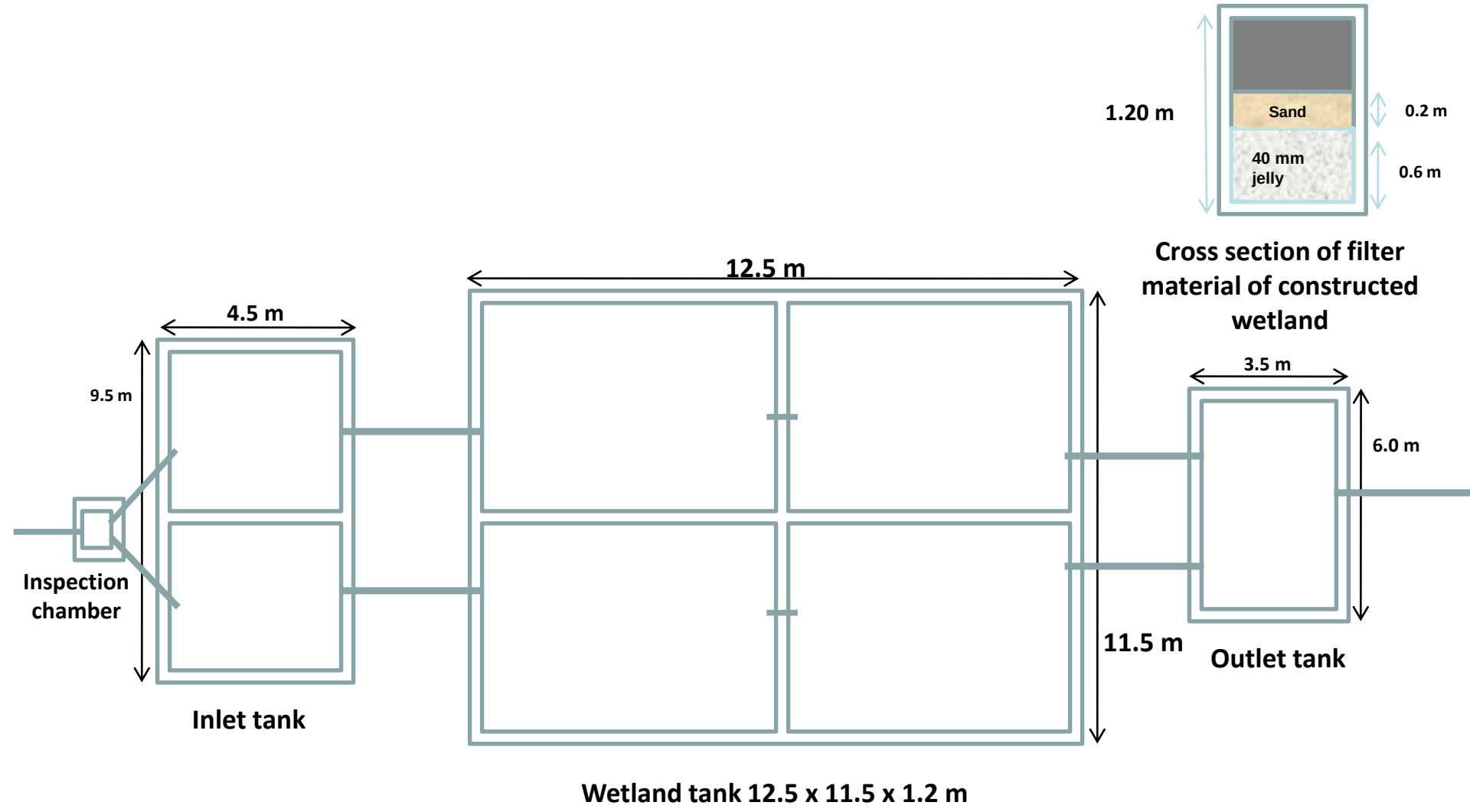
- Sewage effluent irrigation is an age old agricultural practice.
- Sewage effluent – A potential source of water and nutrients.
- Untreated sewage effluent is considered to have high concentration of nutrient elements like N,P, etc., heavy metals and also biological load.

- **Treatment of sewage effluent is must for its safe disposal, otherwise may lead to environmental issues.**

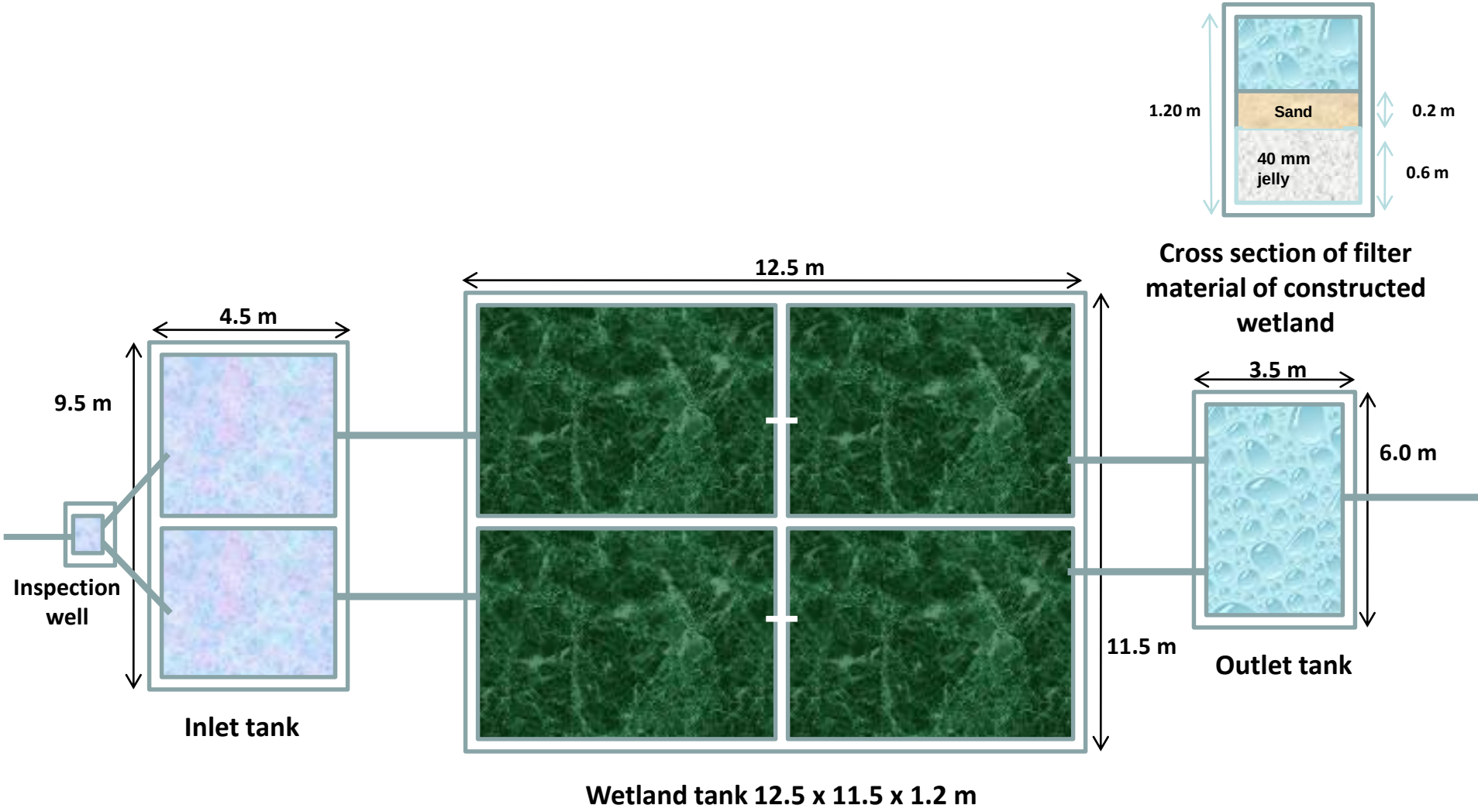
- **The treatment system should be eco-friendly, sustainable and cheaper**

“Constructed Wetlands” : Engineered systems that have been designed and constructed to utilize natural processes involving wetland vegetation, soils and the associated microbial assemblages to assist in treating wastewaters.

- Sewage water passing through constructed wetland will be filtered through both abiotic and biotic processes.
- The suspended solids settle into the substrate as the water moves through the soil and rhizosphere of plants.
- Wetland plants transfer oxygen to the submerged root zone, which allows for the biological breakdown of pollutants and organic materials by microbes (rhizodegradation).
- The hydrophytes help to remove excess N, P and other nutrients and also heavy metals (Phytoextraction)
- The BOD will be lowered by 60-80 % through this process.



Engineered constructed wetland at F block, UAS, Dharwad



Engineered constructed wetland at F block, UAS, Dharwad

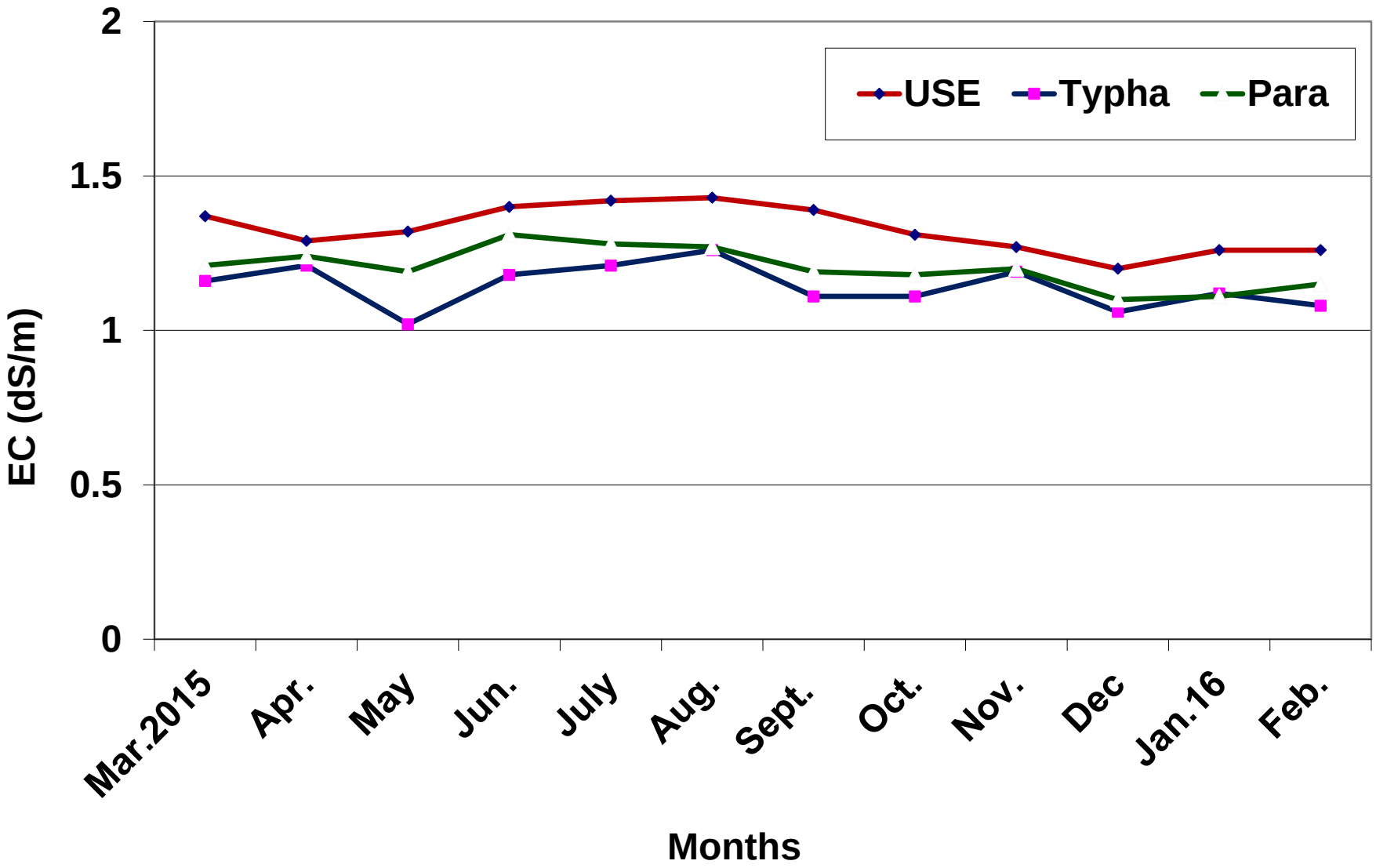
ECWL- established at UAS, Dharwad

Macrophtyes established in ECWL

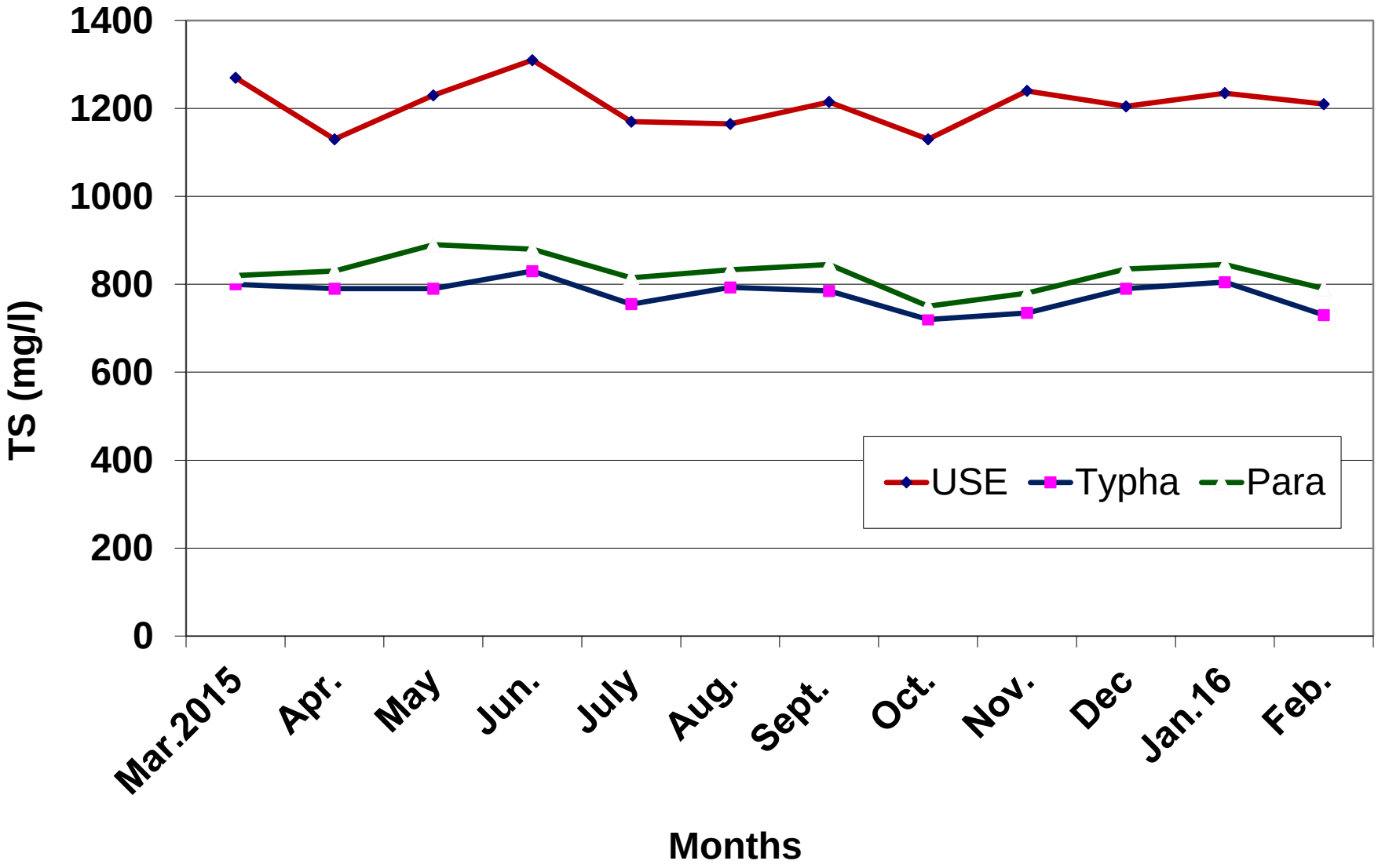
Periodic harvesting of macrophtyes

Studies on the effect of treated waste water on crop productivity

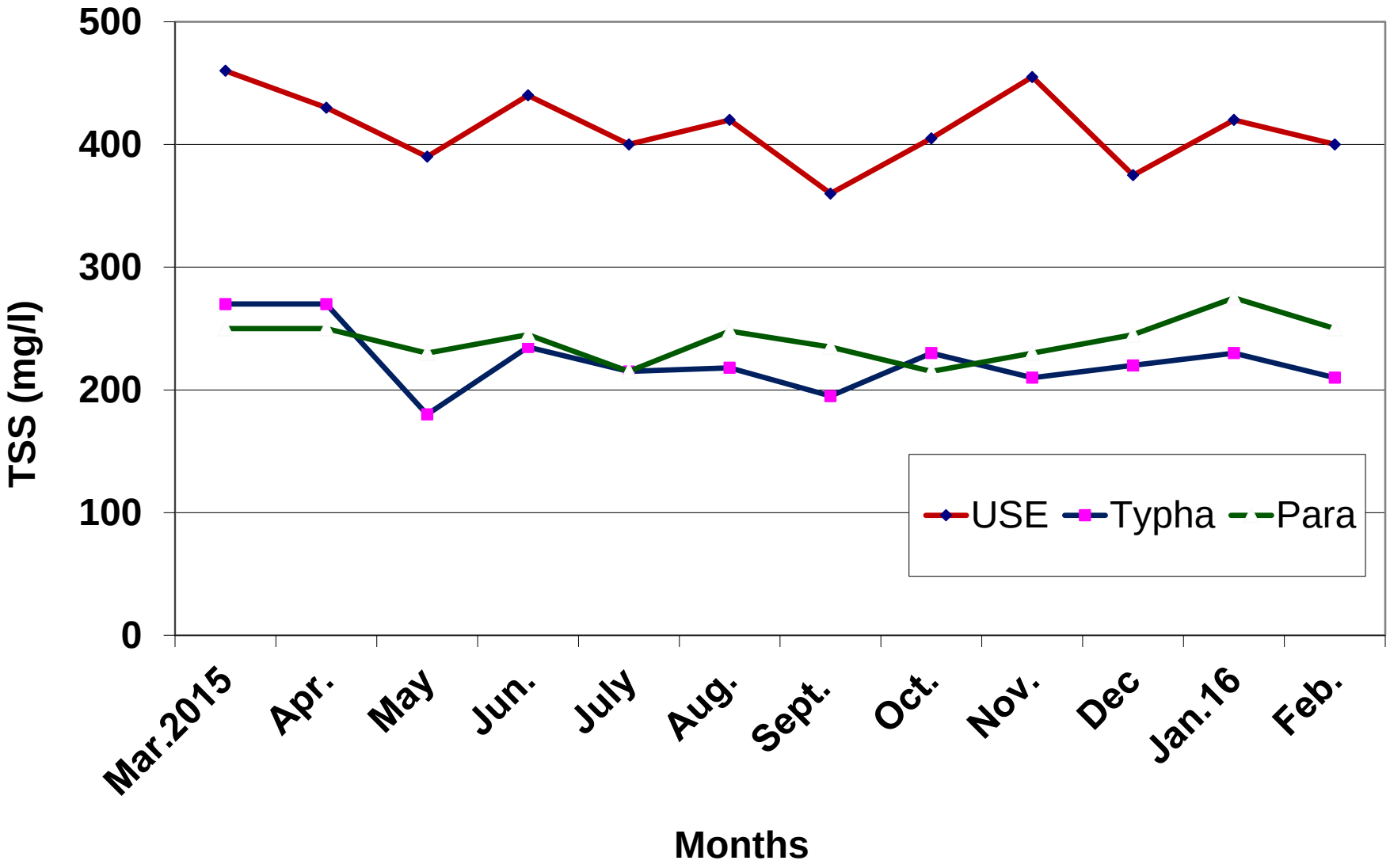
Macrophtyes established in ECWL



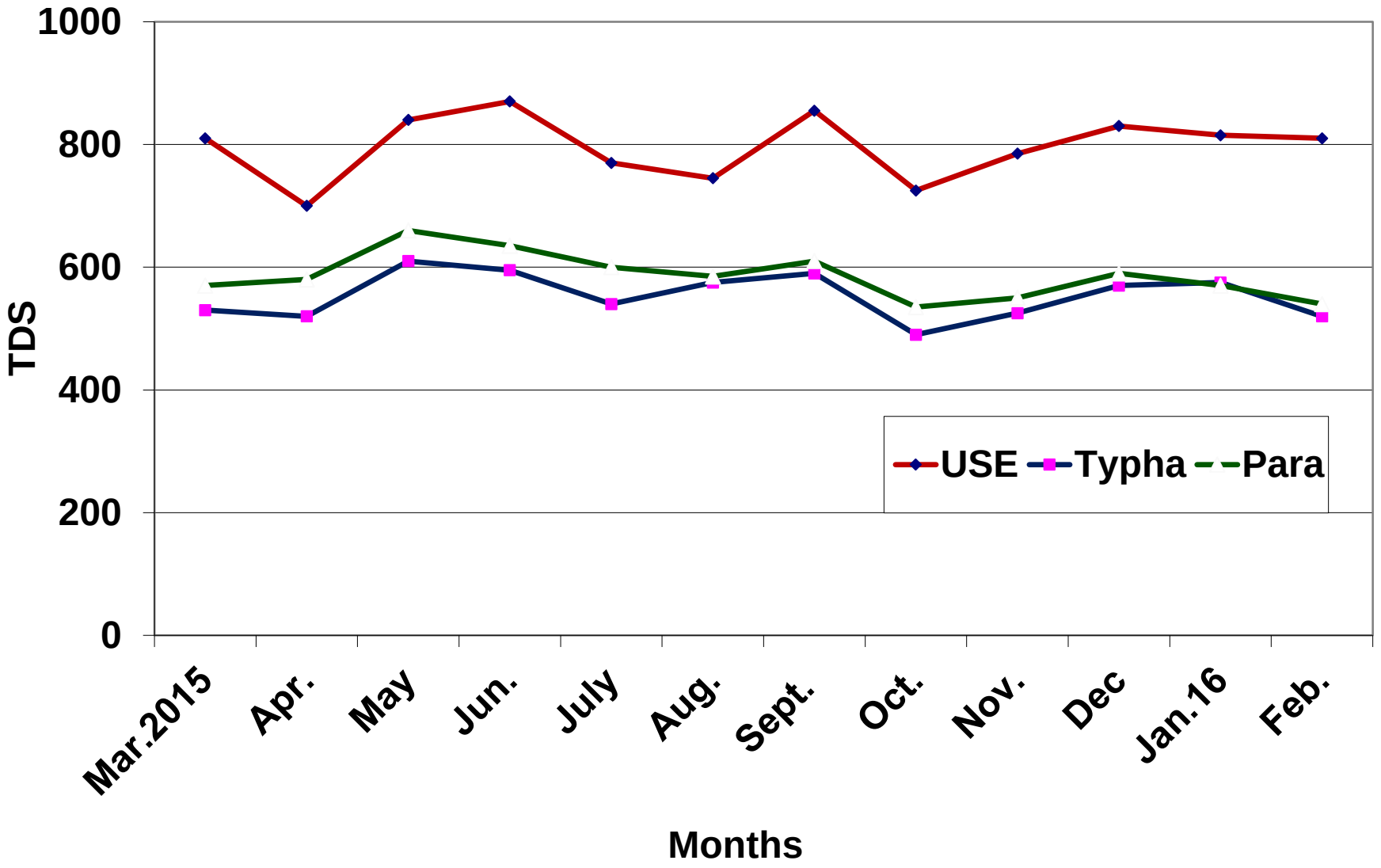
Effect of hydrophytes on EC of sewage effluent



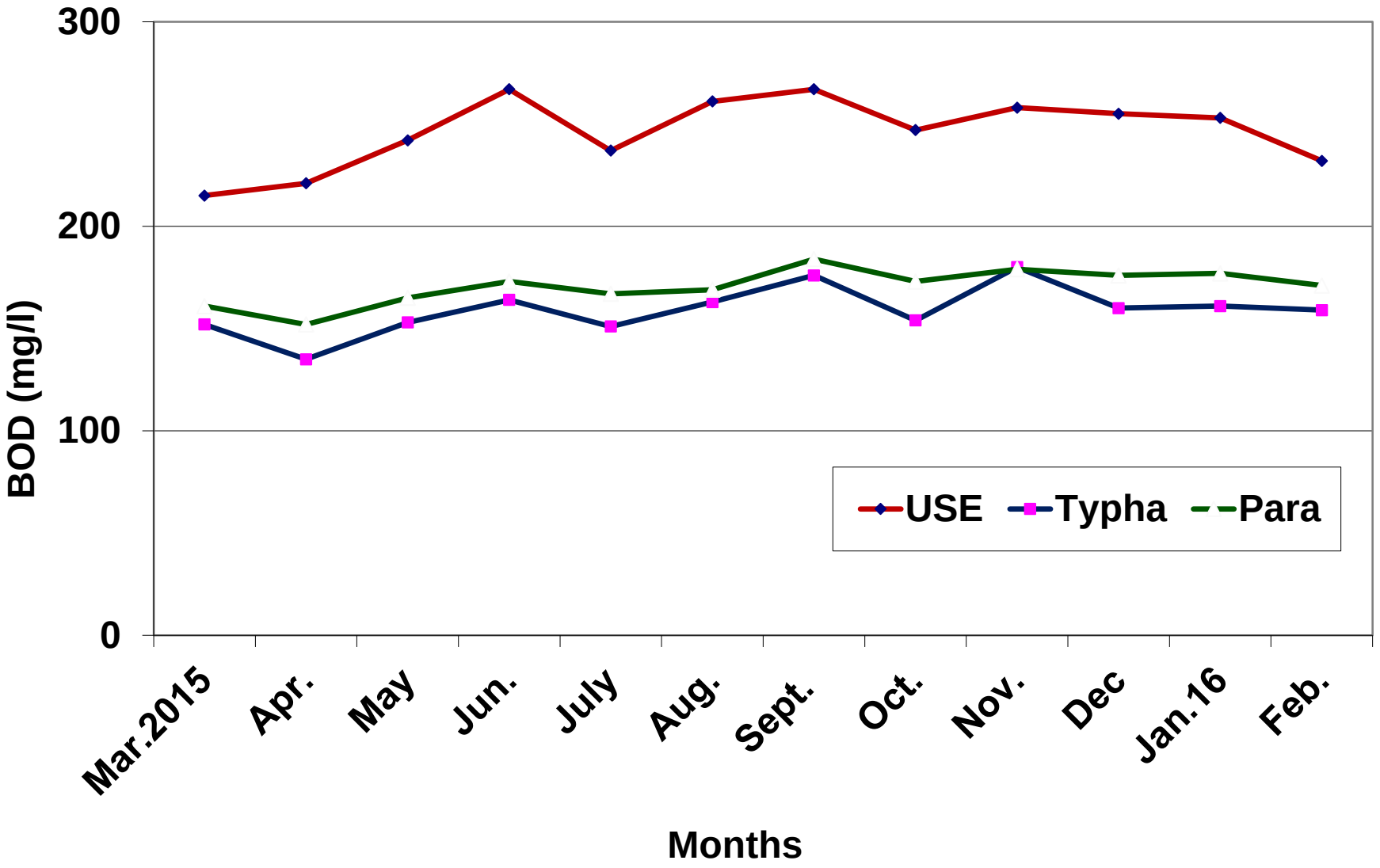
Effect of hydrophytes on TS of sewage effluent



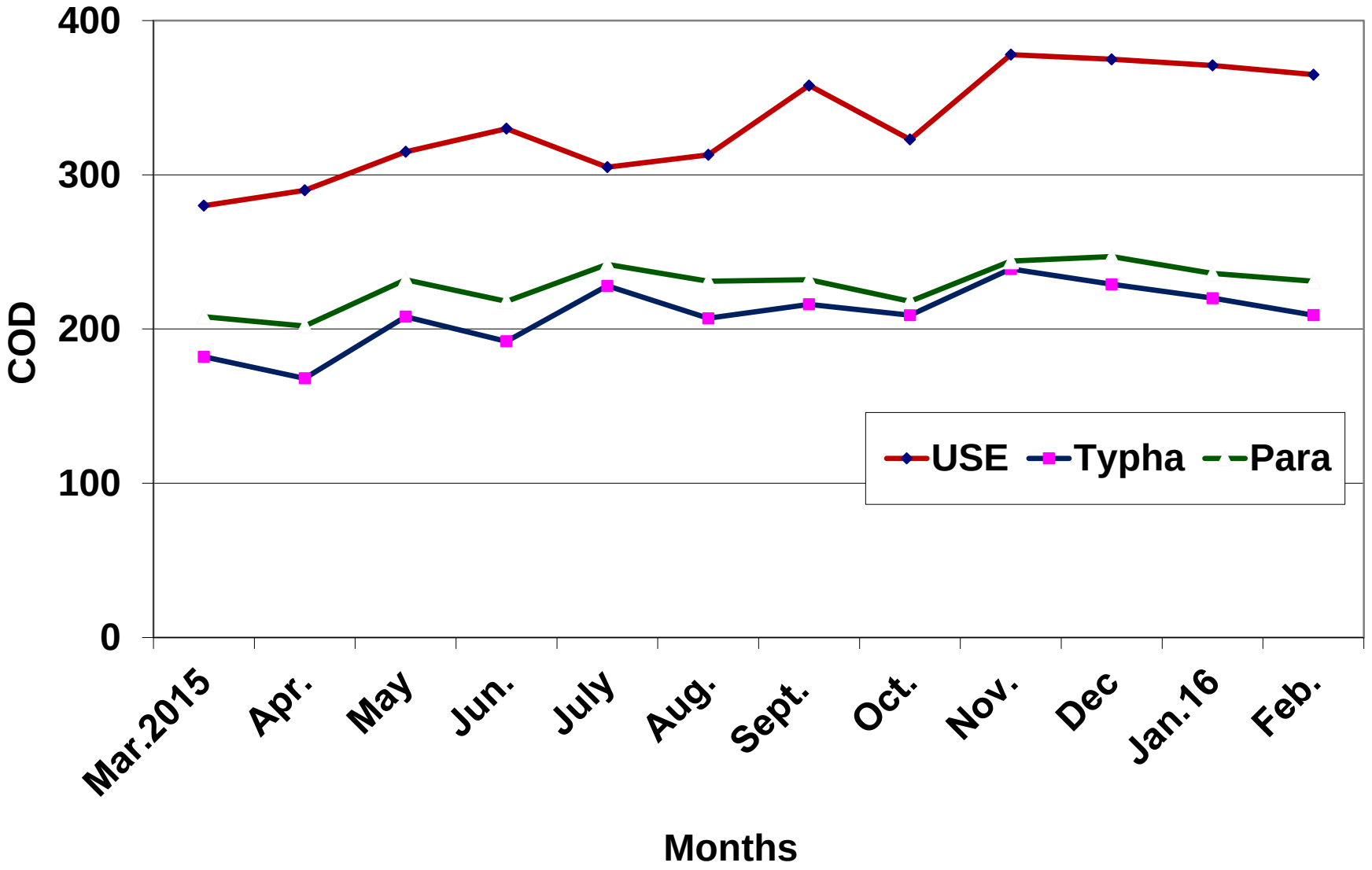
Effect of hydrophytes on TSS of sewage effluent



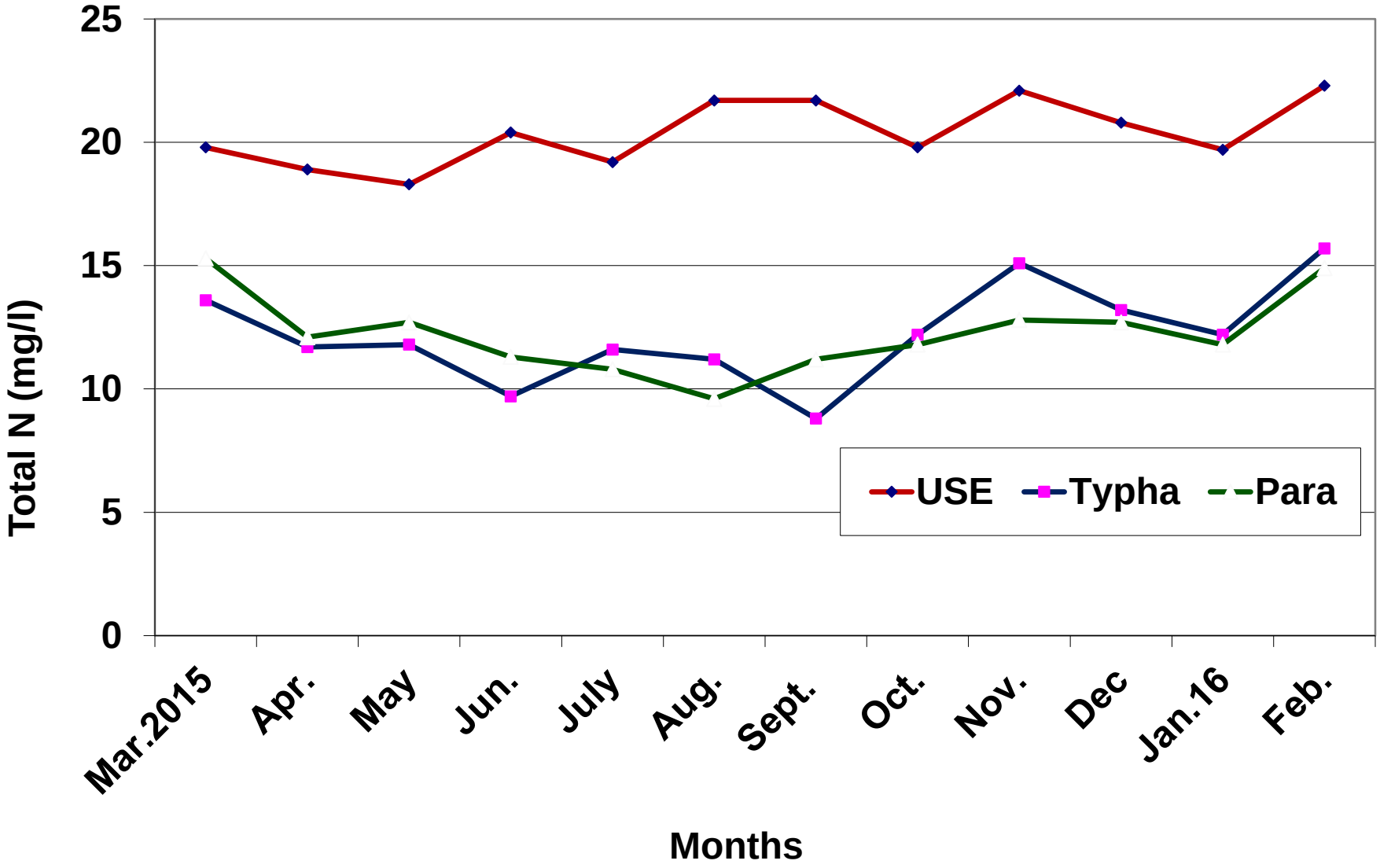
Effect of hydrophytes on TDS of sewage effluent



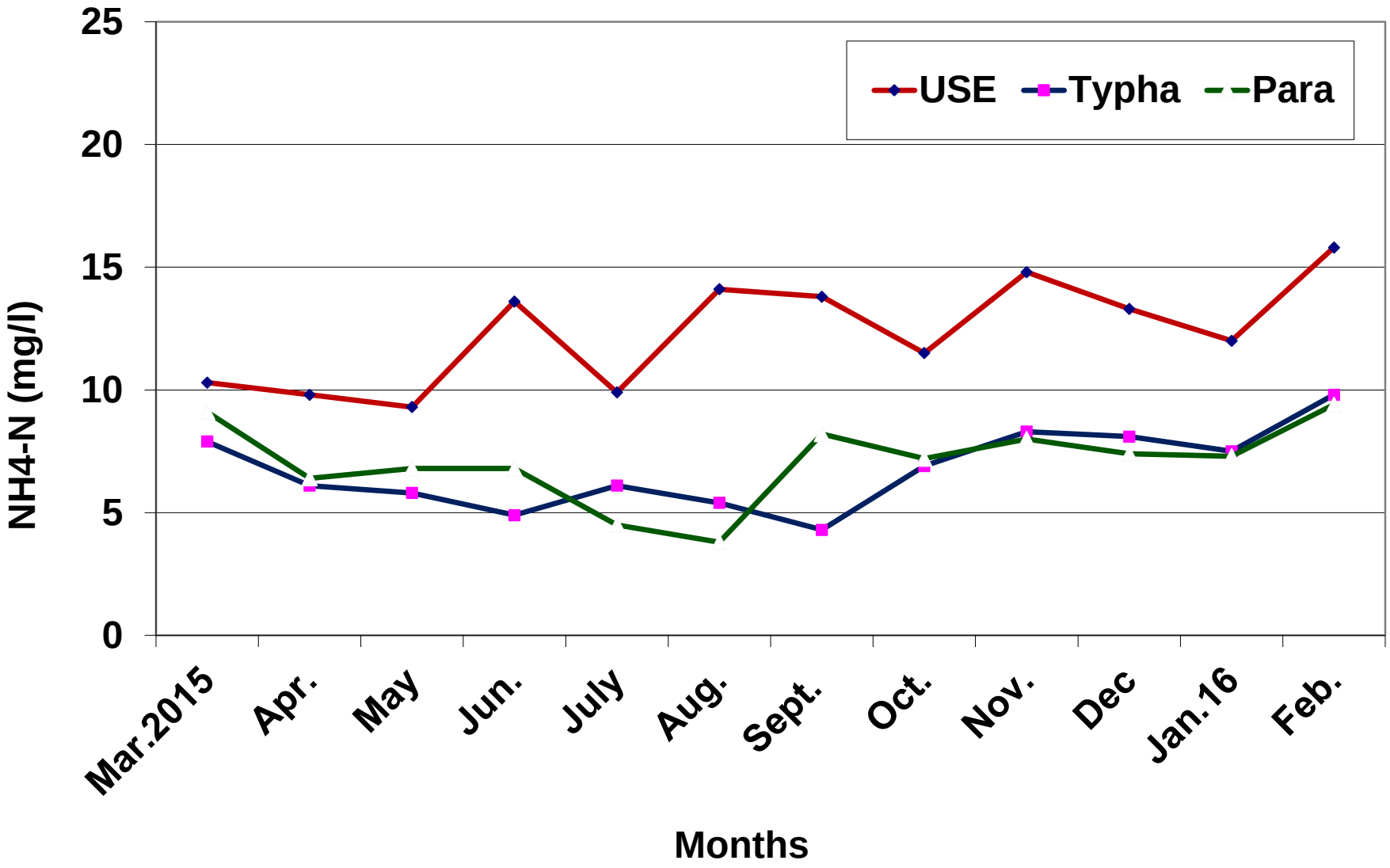
Effect of hydrophytes on BOD of sewage effluent



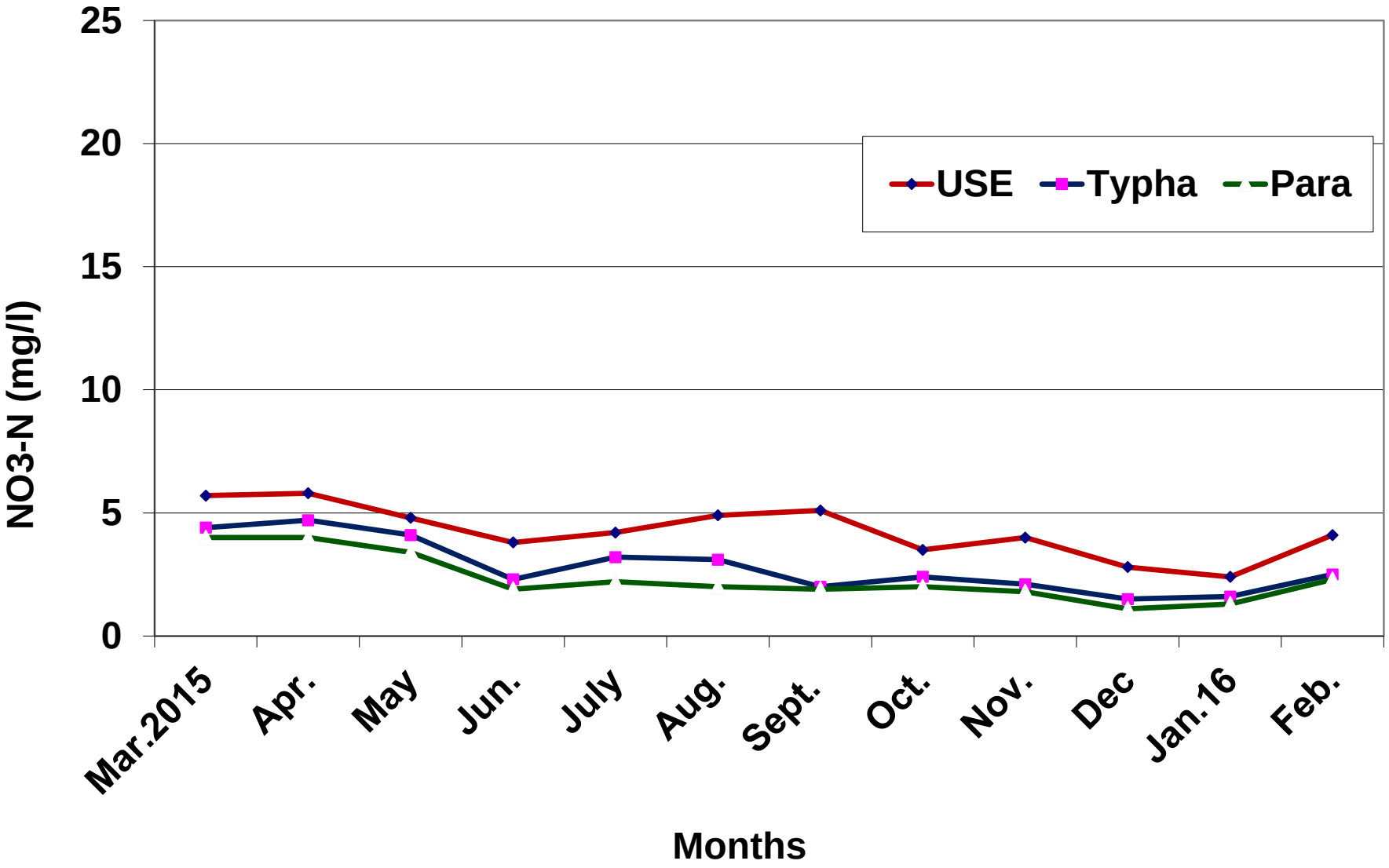
Effect of hydrophytes on COD of sewage effluent



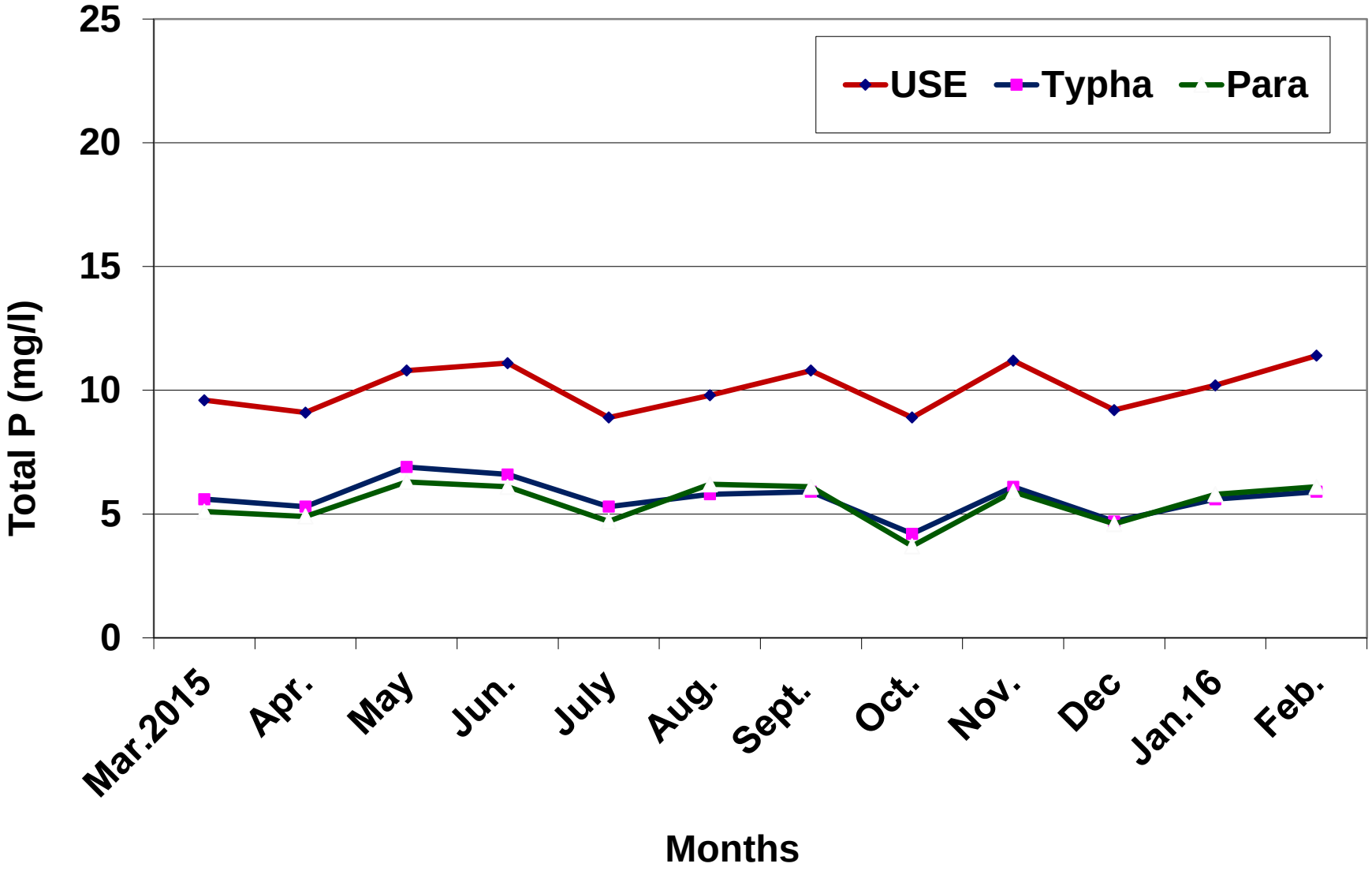
Effect of hydrophytes on Total N of sewage effluent



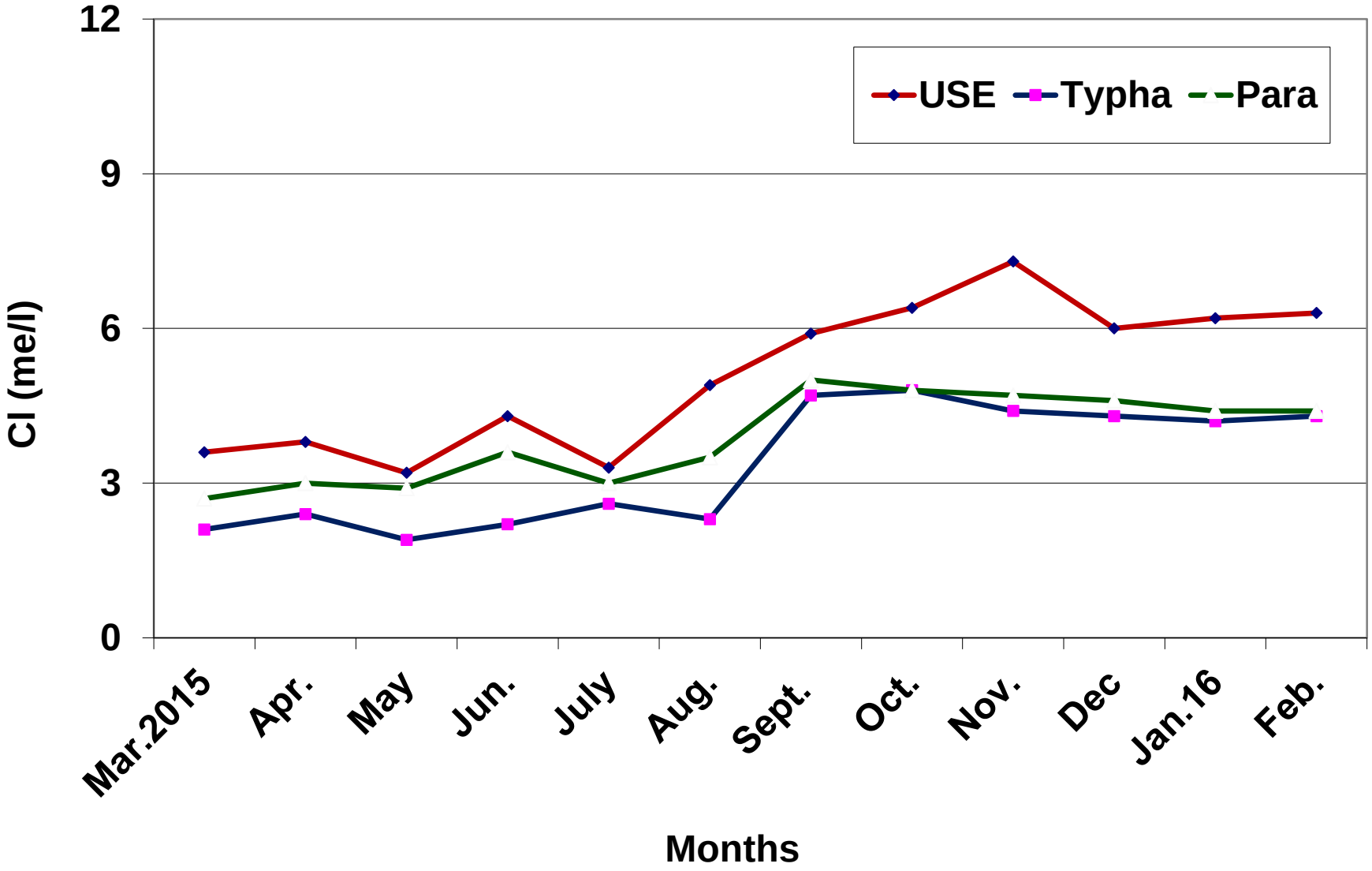
Effect of hydrophytes on NH4-N of sewage effluent



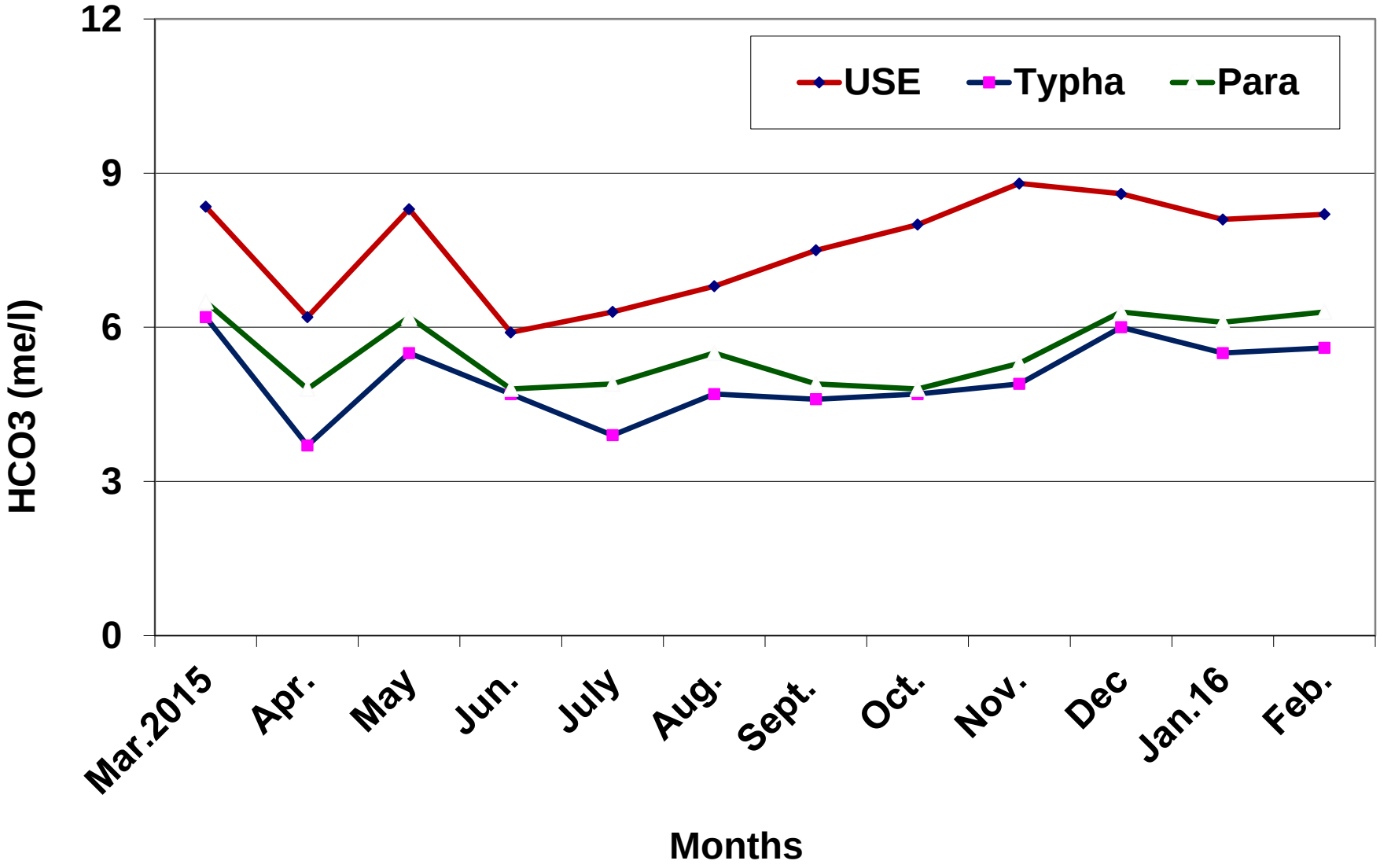
Effect of hydrophytes on NO3-N of sewage effluent



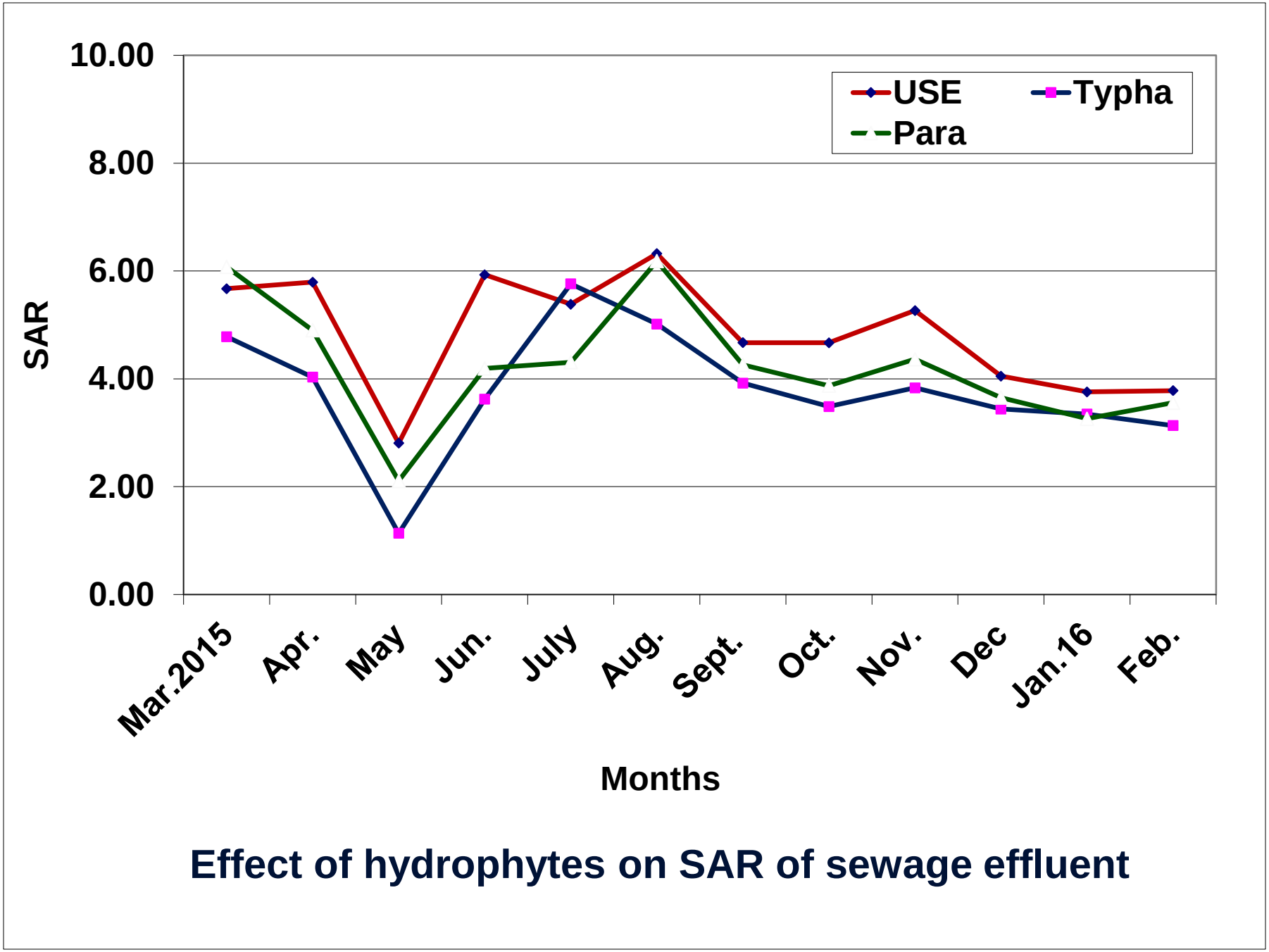
Effect of hydrophytes on Total P of sewage effluent



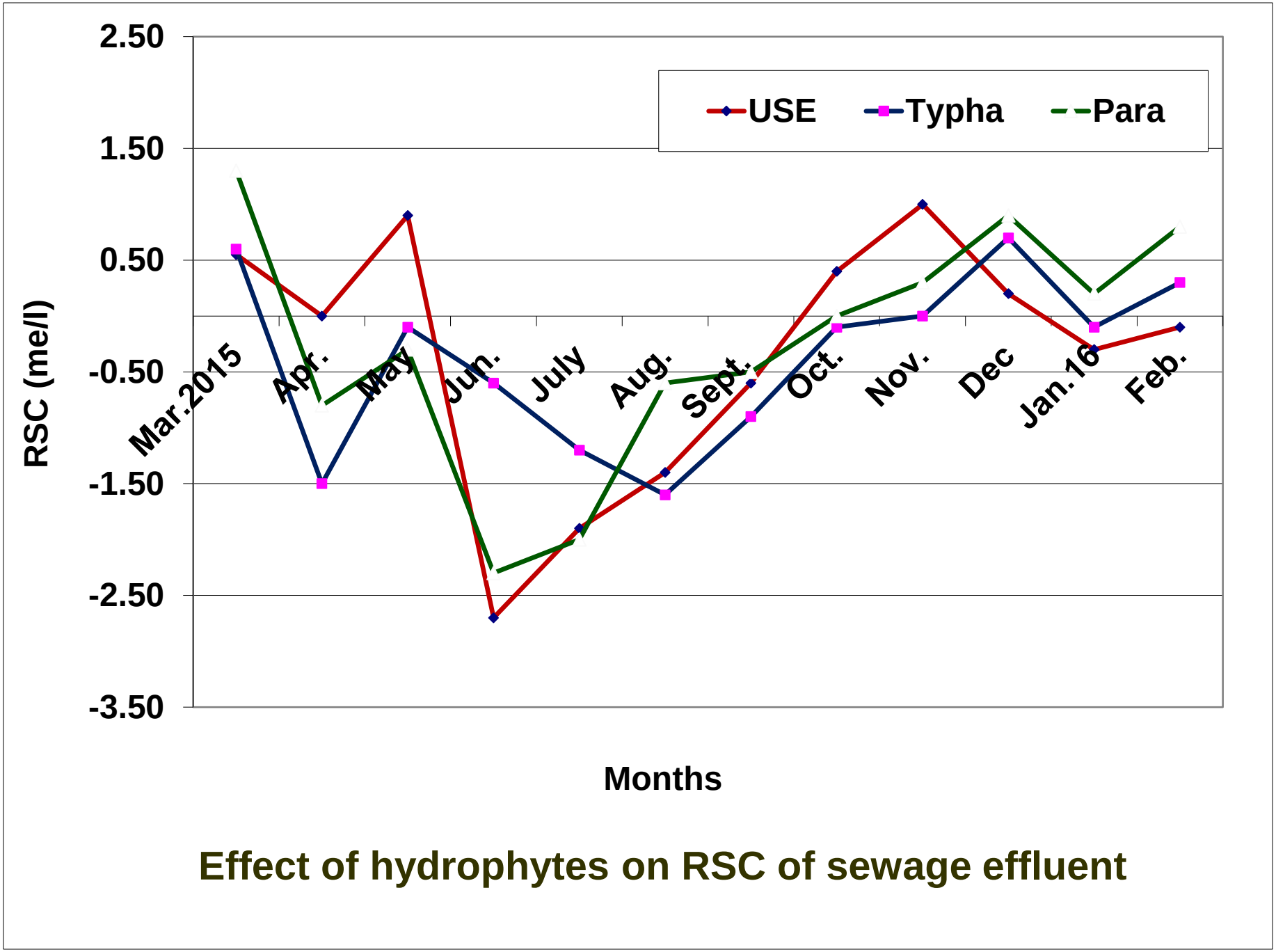
Effect of hydrophytes on Chloride of sewage effluent



Effect of hydrophytes on Bicarbonate content



Effect of hydrophytes on SAR of sewage effluent



Effect of hydrophytes on RSC of sewage effluent

Effect of ECWL treatment on the quality of domestic wastewater at UAS, Dharwad (mean data of one year *i.e.*, 2015)

Parameter	Untreated domestic sewage water	ECWL treated water	Per cent reduction over untreated sewage water
TS (mg l^{-1})	1209	801	33.7
TSS (mg l^{-1})	413	232	43.8
TDS (mg l^{-1})	796	569	28.5
BOD (mg l^{-1})	185	125	32.4
COD (mg l^{-1})	333	219	34.2
Total- N (mg l^{-1})	20.4	12.3	39.7
NO_3^- N (mg l^{-1})	4.3	2.3	46.5
NH_4^+- N (mg l^{-1})	11.9	6.9	42.0
P (mg l^{-1})	10.1	5.6	44.6
Cl (mg l^{-1})	5.1	3.6	29.4
Na (meq l^{-1})	9.6	6.7	30.2
RSC (meq l^{-1})	0.34	-0.30	11.8
SAR	4.83	4.0	17.0

CONCLUSIONS

- ***Typha latifolia*** **induced greater reduction of TS (35.8 %), TSS (45.9 %), TDS (30.5 %), BOD (34.8 %), COD (37.4 %), potassium (47.6 %), Ca+ Mg (36.3 %) and Na (35.3 %).**

- ***Bracharia mutica*** **was efficient in reducing total nitrogen (39.3 %), nitrate nitrogen (45.4 %) ammoniacal nitrogen (40.8 %) and phosphates (45.9 %).**

- **Both *Typha latifolia* and *Bracharia mutica* induced moderation in the quality of the sewage water in respect of SAR, RSC and chloride content**

- **Use of combination of hydrophytes is ideal for wetland planting for overall improvement in the quality of the domestic sewage water for its utilization.**

Brinjal crop under different source of water

Chilli crop under different source of water

Technology dissemination in " 6th India Water week -2016", at New-Delhi

CBSE school children's and others visited the exhibition stall

Minister of water Resources, Bhutan along with his team members visited the exhibition stall

Thank you for your kind attention