STUDY ON USE OF URINE FROM ECO-TOILET IN AGRICULTURAL FARMING AND ITS CO-COMPOSTING WITH SOLID WASTE

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STRUCTURE OF PRESENTATION

- ✓ DOMESTIC WASTEWATER SCENARIO AND ECOSAN IN INDIA
- ✓ RESEARCH OBJECTIVES
- ✓ MATERIALS AND METHODOLOGY
- ✓ RESULTS AND DISCUSSION
- ✓ CONCLUSIONS
- ✓ ACKNOWLEDGEMENTS

DOMESTIC WASTEWATER IN INDIA

- WASTEWATER COLLECTED 22,900 MLD
- WASTEWATER TREATED 5,900 MLD
- REST OF WASTEWATER UNTREATED
- WASTE TREATED IN MEGA CITIES 26 %
- WASTEWATER FROM SMALLER SETTLEMENTS NOT COLLECTED AND TREATED
- HUGE QUANTITIES OF TREATED WATER USED IN SEWER SYSTEMS

ECO-SANITATION IN INDIA

- PREACHED AND STARTED BY MAHATMA GANDHI – THE FATHER OF NATION IN EARLY 1900's
- IMPORTANCE IS GIVEN IN LATE 1900's
- MANY OF THE STATES ARE FOLLOWING ECO-SAN APPROACH IN PERI-URBAN AND RURAL AREAS
- SOUTHERN INDIAN STATES ARE WELL AHEAD IN PROMOTING AND SUPPORTING ECO-SANITATION

ECO-FRIENDLY

EXCRETA DISPOSAL SYSTEM

ECO-TOILET

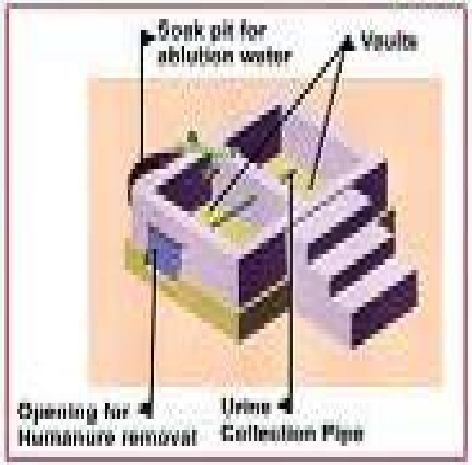
DEVELOPED BY

DEPARTMENT OF ENVIRONMENTAL ENGINEERING
S.J. COLLEGE OF ENGINEERING
MYSORE-570 006

SPONSORED BY

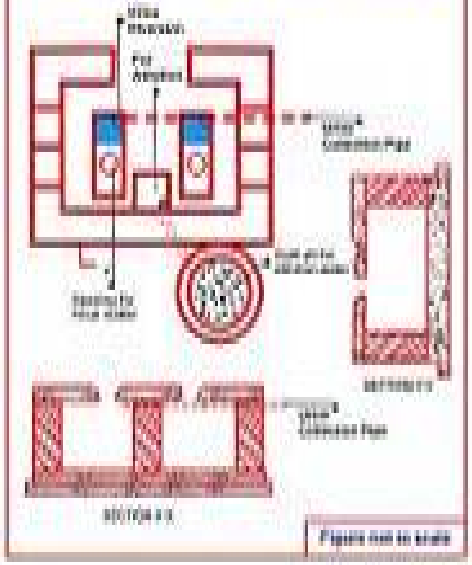
ZILLA PANCHAYAT
MYSORE

TWO VAULT ECO-TOILET AT KENCHALAGODU, MYSORE



Improvised Eco-Toilet at Doddaballapur

Plan & Section of Two Vault Eco-Toilet



RESEARCH OBJECTIVES

- TO EVALUATE THE NUTRIENT VALUES OF HUMAN URINE
- TO ASSESS THE FERTILIZING EFFECT OF HUMAN URINE
- YIELD COMPARISON OF GREEN GRAM (PUSA BAISAKI) UNDER DIFFERENT APPLICATIONS
- TO EVALUATE THE DEGREE OF CO-COMPOSTING OF SOLID WASTE WITH HUMAN URINE BY CONDUCTING BENCH-SCALE AND PILOT- SCALE STUDIES

MATERIALS AND METHODOLOGY

- **HUMAN URINE** COLLECTED IN A WATER LESS URINAL INSTALLED AT M/s. WASTEWISE TRUST LAND LAB, MAHADEVAPURA, BANGALORE, KARNATAKA, INDIA
- CROP – PUSA BAISAKI (GREEN GRAM)
- FERTILIZERS – UREA, SUPER PHOSPHATE AND MURIATE OF POTASH
- METHOD OF CULTIVATION

SEASON – SUMMER / KHARIF (FEBRUARY IS IDEAL)

DURATION – 65-70 DAYS

SEED RATE – 15-20 Kg/HECTARE

SPACING – ROW-ROW 30 CM

SEED TO SEED – 7.5 -10 CM

PLOT SIZE – 7.1 m X 4.7 m = 34 m^2 AREA

COLLECTION OF HUMAN URINE

COMPOST REACTORS

BENCH-SCALE

PILOT SCALE

METHODOLOGY

TYPES OF APPLICATION

- RANDOMIZED BLOCK DESIGN
  - WATER APPLICATION
  - FERTILIZER APPLICATION
  - HUMAN URINE APPLICATION

HUMAN URINE APPLICATION

- ONCE OR TWICE
- STOPPED 1 MONTH BEFORE HARVESTING

- COMPOST – CONSISTED OF FRUIT PEELS, VEGETABLES, GRASS CUTTINGS, LEAVES, COCONUT HUSK
- BENCH SCALE COMPOSTING REACTORS
- PILOT SCALE COMPOSTING REACTORS

RESULTS AND DISCUSSION

- IMPACT OF URINE ON THE GROWTH AND YIELD OF PUSA BAISAKI (GREEN GRAM)
- IMPACT OF URINE ON NUTRIENTS AND OTHER PARAMTERS
- COMPARISON OF YIELD OF PUSA BAISAKI AND COST ECONOMICS
- COMPOSTING OF MUNICIPAL SOLIDWASTE IN CONJUNCTION WITH HUMAN URINE
- BENCH AND PILOT SCALE STUDIES
- IMPACT OF URINE ON RATE OF COMPOSTING

PREPARATION OF COMPOST

BENCH-SCALE

- FRUIT PEELINGS : 500 GRAMS
- COCONUT HUSK : 50 GRAMS
- OLD COMPOST : 130 GRAMS
- HUMAN URINE : 0, 50, 150, 250 GRAMS

PILOT-SCALE

- FRUIT PEELINGS, VEGETABLES, GRASS AND LEAVES : 14 Kg
- COCONUT HUSK : 2 Kg
- OLD COMPOST : 10 Kg
- HUMAN URINE : 0, 2, 4, 8 Kg

WATER APPLIED PLOT

FERTILIZER APPLIED PLOT

HUMAN URINE APPLIED PLOT

COMPARISON OF GREEN GRAM YIELD WITH WATER AND FERTILIZER APPLIED PLOTS

Treatment	Yield (%)		
	Pod (Without seed)	Seed	Bio mass
T_0 - Water applied	77.28	72.22	80.00
T_1 - Fertilizer applied	100.00	100.00	100.00
T_2 - Urine applied	93.19	95.18	140.00

EFFECT OF HUMAN URINE ON VARIOUS PARAMETERS AFTER HARVEST

Treatment		pH	Nitrogen (%)	Phosphorus (%)	Potassium (%)	Organic Carbon (%)
T_0 _Water applied	Seed	6.28 ± 0.04	2.99 ± 0.02	0.22 ± 0.01	0.78 ± 0.01	30.89 ± 0.04
	Plant	6.80 ± 0.01	0.74 ± 0.00	0.27 ± 0.01	0.96 ± 0.01	13.66 ± 0.02
	Soil	7.20 ± 0.02	0.013± 0.00	26.88 ± 0.04	168 ± 0.41	0.56 ± 0.02
T_1. Fertilizer applied	Seed	6.17 ± 0.01	4.42 ± 0.02	0.48 ± 0.01	0.99 ± 0.00	32.67 ± 0.07
	Plant	7.25 ± 0.02	1.75 ± 0.01	0.53 ± 0.02	1.41 ± 0.01	29.11 ± 0.04
	Soil	7.32 ± 0.03	0.016± 0.00	35.82 ± 0.04	280 ± 0.08	0.72 ± 0.01
T_2 _Urine applied	Seed	6.33 ± 0.01	4.28 ± 0.01	0.38 ± 0.00	0.85 ± 0.02	32.67 ± 0.07
	Plant	7.08 ± 0.26	1.69 ± 0.01	0.39 ± 0.01	1.04 ± 0.03	32.08 ± 0.08
	Soil	7.05 ± 0.02	0.015± 0.00	33.81 ± 0.02	168.75 ± 0.62	0.61± 0.01

COST ECONOMICS OF HUMAN URINE

PARAMETER	CHEMICAL FERTILIZER	HUMAN URINE
TOTAL EXPENDITURE (INR)	11,652.51	11,190.54
TOTAL RETURNS (INR)	16,800.68	16,326.63
COST BENEFIT RATIO	1:1.44	1:1.46

NUTRIENT VALUES OF COMPOST

BENCH-SCALE

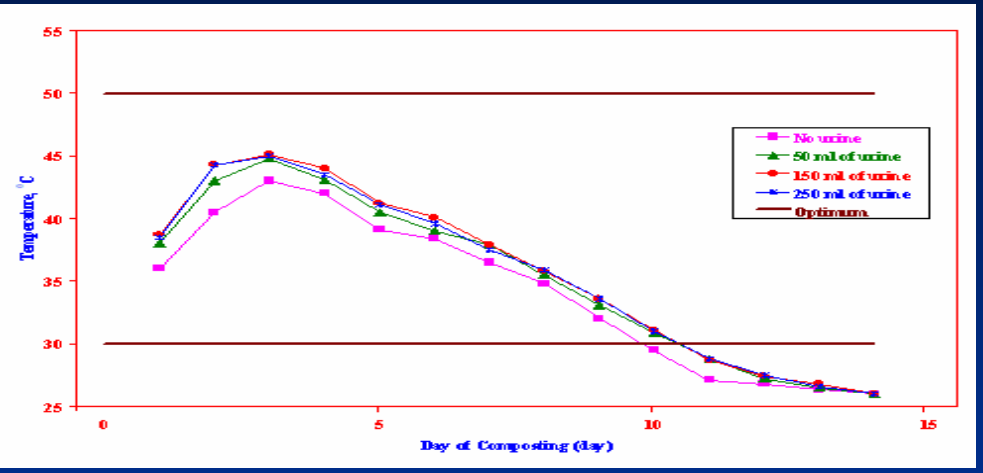
Sl. No.	Parameter	pH	Organic Carbon (%)	Nitrogen (%)	Phosphorous (%)	Potassium (%)	C/N ratio
1	No urine	7.96	13.51	0.88	0.67	1.20	15.35
2	50 ml urine	7.84	17.82	2.97	0.70	1.44	6.00
3	150 ml urine	8.00	20.17	2.85	0.76	1.40	7.07
4	250 ml urine	7.77	16.40	2.64	0.78	1.48	6.21

PILOT-SCALE

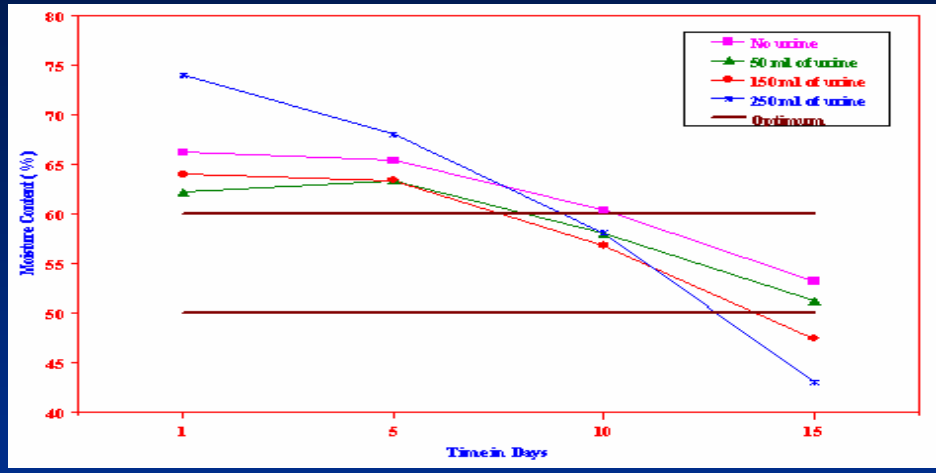
Sl. No.	Parameter	pH	Organic Carbon (%)	Nitrogen (%)	Phosphorous (%)	Potassium (%)	C/N Ratio
1	No urine	7.58	10.61	0.75	0.60	1.20	14.15
2	2.0 l urine	7.30	10.70	2.09	0.69	1.35	5.12
3	4.0 l urine	7.49	11.30	2.26	0.80	1.42	5.00
4	8.0 l urine	8.12	12.46	1.82	0.87	1.68	6.85

BENCH SCALE STUDIES

VARIATION OF TEMPERATURE WITH TIME



VARIATION OF MOISTURE CONTENT WITH TIME



PILOT SCALE STUDIES

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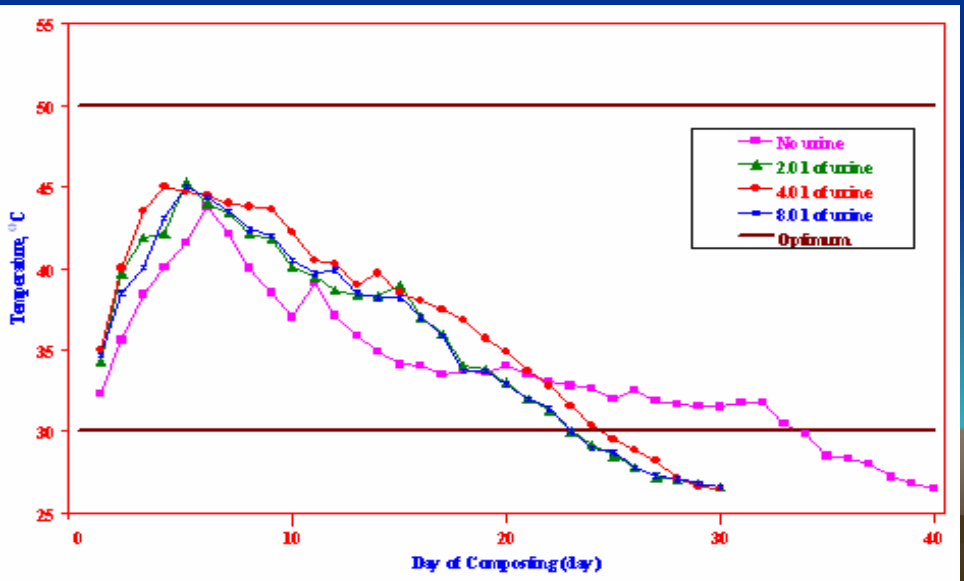

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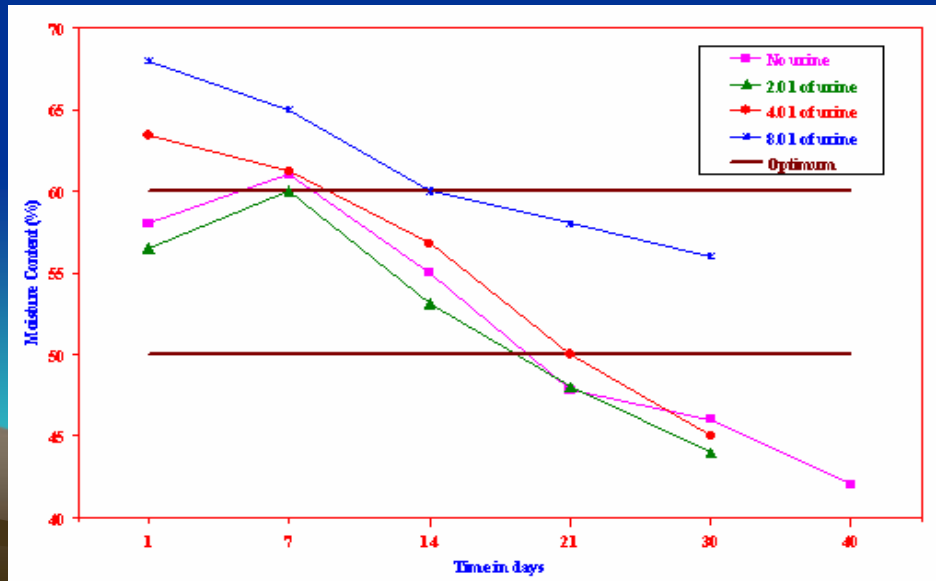

SUMMARY AND CONCLUSIONS

- URINE IS A QUICK-ACTING NITROGEN-RICH COMPLETE FERTILIZER
- THE YIELDS OF THE GREEN GRAM (PUSA BAISAKI) IN HUMAN URINE APPLIED PLOTS ARE AT PAR WITH THE CHEMICAL FERTILIZER APPLIED PLOTS
- THE COST BENEFIT RATIO ANALYSIS OF GREEN GRAM PRODUCTION INDICATES THAT THE ECONOMICS ARE IN FAVOUR OF HUMAN URINE APPLICATION INSTEAD OF CHEMICAL FERTILIZER APPLICATION
- URINE ACTS AS A GOOD ACTIVATOR AND INDUCES QUICK REACTION FOR COMPOSTING
- AS THE C/N RATIO REDUCES THE COMPOSTING PERIOD REDUCES SIGNIFICANTLY (FROM 40 DAYS TO 30 DAYS)

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THANK YOU

Protect Environment

Save Future