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Collection, Transportation, Storage & Utilization of Human Urine

An average human being gives out 750 to 1000 ml. of urine per day. This comes to about 500 lit per day. Thus urine is one of the principal wastes of human origin.

Unlike feces, urine contains no or very few pathogens. On the other hand urine is a potent source of plant nutrients (on an average 15 to 19 % N, 2.5 to 5 % P,3 to 4.5 % K on dry wt basis) In India & China it had been a traditional practice to use human as well as bovine urine as fertilizer. The manure obtained from human urine is rightly called Hirakhad (Hira = Diamond) which is more precious than Sonkhad- the manure of feces (Sona = Gold) Today unfortunately this much valued source of organic manure is neglected & wasted.

Nirmal Gram Nirman Kendra has undertaken a project entitled "Experimentation on Utilization of Human Urine as fertilizers". The project has been co-funded by UNICEF & SEI.

The broad objectives of the project are,

1. To determine the efficacy of human urine as fertilizer &
2. To evolve methods for collection, transportation, storage & utilization of human urine

This paper highlights the outcome of the second objective of the project.

Although it is known that human urine has fertilizer value, it is not being utilized on large scale. The obvious reason behind this is the psychological repugnance towards urine. This is mainly because of

i) Foul odour
ii) Decomposition on storage &
iii) A universally accepted fact that anything given out of human body is untouchable.

If these hurdles are overcome, there could be a revolutionary change in the utilization of human urine.

If anyone wishes to replace the entire fertilizer input of a single crop with human urine, the quality required is in thousands of liters per hectare. This obviously can not be fulfilled with the urine outputs of a single family. Therefore efforts are necessary to harness the urine from public places like- schools, colleges, market places, offices, theatres etc.

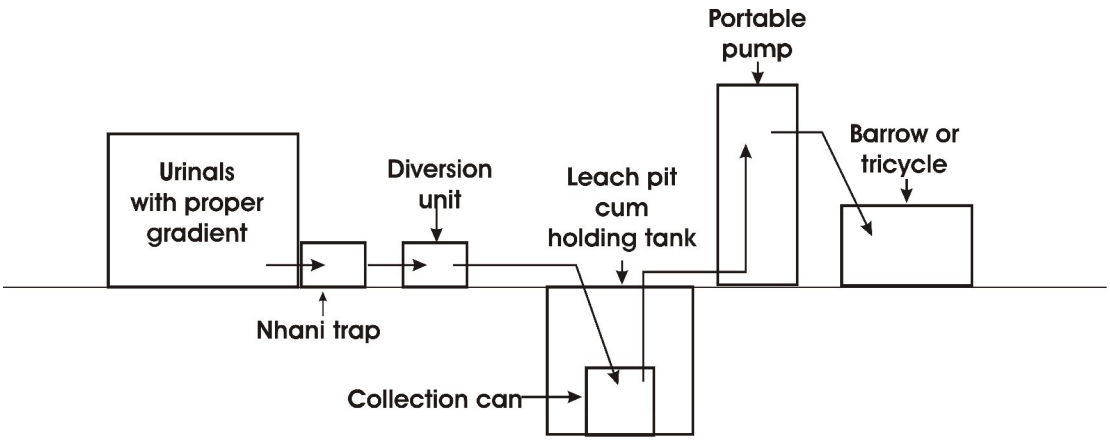
Following experiments are being carried out at NGNK to evolve simple, low cost yet effective techniques for harnessing the source of human urine from public places.

(A) Collection of human urine

Objectives-

a) No direct handling of human urine.
b) Odour free environment at the collection point.
c) No mixing of cleaning water with urine.

Following system has been developed to achieve the objectives-



Components of a scientific Urine collection system

No.	Components	Function/characteristic
1	Urinals with a channel/drain having a proper gradient	i) Does not require flushing after every urination. Cleaning with water once in a day is sufficient to maintain odour free environment.
2	P trap or Nhani trap	i) Keeps urinal odour free ii) No access for flies and mosquitoes.
3	Leach pit –cum- holding tank for collection drum/can.	i) Convenience in transit storage. ii) Facilitates leaching of excess urine in case of occasional over flow of the collection drum iii) Facilitates leaching of cleaning water.
4	Collection drum/can	Plastic container with removable lid
5	Diversion unit	i) Avoids mixing of cleaning water with urine. ii) Simple operation- untouched by the hand.
6	Portable pump assembly	i) Piston pump – easy & hassle free operation ii) No handling of direct urine iii) Non-corrosive material (PVC)-suitable for pumping urine iv) Portable & foldable – can be carried by the operator.

Urinals with proper gradient

Leach pit cum holding tank with can

Diversion unit

Portable pump

Pumping operation

(B) Transportation of urine

Objectives-

i) No direct handling of human urine
ii) Urine not exposed to atmosphere while transporting
iii) No machine/power based transport

To fulfill the above objectives a wheel barrow has been designed which accommodates two 30 lit. plastic cans with tight lids (Total carrying capacity 60 lit). The barrow is kept near the pump and the discharge tube is directly led into the can. (see photo) This facilitates direct pumping of urine from the drum kept in the leach pit to the carrying cans.

In this system, no direct handling of urine is involved, urine is transported in fully covered cans and there is no power required either for pumping or for transportation.

A tricycle has also been designed which is fitted with a PVC piston pump & accommodates four 30 lit.cans (Total carrying capacity 120 lit) (see photo)

The choice between a barrow and a tricycle will depend upon - i) quantity of urine available at a given place and ii) distance to be traveled.

The barrow as well as the tricycles are elegantly coloured which helps in maintaining the dignity of the activity of urine collection and that of the person doing the collection.

(C) Storage

The easiest way of utilizing urine as fertilizer, on a very small scale would be- i) to directly urinate in the field or ii) to collect one's urine in a day's time and apply it to the desired crop the next day. But both these methods are not practicable when it comes to utilizing urine on large scale. Similarly this solution does not suit to urinals at public places. Hence storage of collected urine for a certain period is necessary. This aspect is being studied in the project under reference.

Objectives –

i) To determine the suitability of different containers available in rural areas

ii) To study the loss of nutrients if any during storage period.

Following containers are taken for experimentation.

i) Plastic can with lid.
ii) Earthen pot
iii) Cement pot
iv) Plastic can with lid having very thin oil layer over urine.

The sample from each container are to be tested after every 20 days. Although the experimentation is still not complete the results from plastic can with thin oil layer over urine are encouraging.

Avoidance of foul odour & decomposition.

Characteristic foul odour and decomposition are main hurdles when it comes to storing the urine for a certain period. An experiment to overcome this problem is also planned under the project with an aim to evolve simple and low cost technique for avoidance of decomposition and foul odour.

(D) Utilisation

The common method recommended for fertilizing with urine is direct application to the crops in liquid from. This is done either by pouring the urine manually with the help of cans or by using highly mechanized tankers with coulters. In addition to this it is also necessary to evolve methods of urine utilization which will match the conventional manures/ fertilizers in solid form. With this view following experiment are included in the project.

1) Blending of FYM / compost / ash with urine

It is expected that this will enrich the substrate. Similarly it will also help in retaining the manurial contents of urine.

Salient features of the experiment.
a) Substrates – i) vermicompost ii) FYM iii) Common ash
b) Technique for blending – i) Maximum imbibition of measured quantity if urine in weighed quantity of the substrate by manual mixing.
ii) Spreading the substrate in shade.
iii) Repeating blending after two days.
iv) Analyzing the samples for nutrient contents.

2) Jeewamrut method

This method is very popular among organic formers in which a mixture of cow dung (1 kg) Cow urine (1 lit) and jaggery (10 gm) is kept in earthen pot for 7 days. During this period it undergoes fermentation i.e. biological enhancement of the manure. After 7 days this is diluted with water (1:10) and applied to the crops. The results of this method are very much encouraging.

An experiment is being carried out under the project to replace cow urine with human urine. The results are being tested on coriander.

3) Direct utilization of urine while making compost.

It is also recommended that while preparing conventional aerobic compost, urine can be periodically spread on the garbage / agro waste in the compost unit. This will enrich the final product i.e. compost and it may perhaps reduce the time required.

Epilogue

Human urine is a potent source of organic fertilizer which is being wasted today. Similarly mismanagement of urine invites many consequences such as unhygienic surroundings, foul odour, disease-prone environment etc. Evolving techniques for hygienic collection, storage & utilization of human urine can solve the above problems & at the same time this potent source can replace the harmful synthetic fertilizers to some extent. Collection & utilization of human urine can be a source of employment in rural as well as urban areas.

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