

Risks and Safe Handling of urine from Urine Diversion Dry Toilets (UDDT)

Urine- the cleanest fertiliser

Urine is one of the by products from ecosan toilets. Urine is one of the cleanest fertilizers available to the agricultural community. When urine is applied to crops instead of fertilizers, we save the expenditure on the latter while achieving the same yield increase.

- ◆ Urine is a liquid fertilizer, which is rich in valuable plant nutrients i.e. nitrogen, potassium, phosphorus and sulphur. This is because most of the nutrients absorbed by the human body from the food we eat are excreted via urine.
- ◆ Urine has a formulation similar to ammonium and urea composition, which are fertilizers with comparable results on plant growth.
- ◆ The nutrients in urine are in ionic form and are easily taken up by plants, just like those in chemical fertilizers
- ◆ The use of urine in agriculture improves pH, the nutrient content and the ability of plants to withstand insects, parasite attacks and pests



RISKS ASSOCIATED WITH URINE

Urine is normally sterile in the urine bladder, but “picks up” organisms that occur in the lower parts of the urinary tract.

Even though some pathogens may be excreted in urine, the faecal cross-contamination that may occur by misplacement of faeces in the urine-diverting toilet is related to the most significant health risk.

Pharmaceuticals and hormones can also be excreted with urine, but the risk of negative effects to plants or human beings is minimal in comparison with the risk when using animal manure, sewage sludge or conventional fertilizers.

The major pathogens excreted in the urine can cause: typhoid, paratyphoid and bilharzias in human beings.

SAFE HANDLING OF URINE AND ITS APPLICATION IN THE GARDEN

Untreated urine is dangerous to human life and should be handled with care.

Urine is sanitized on the principle of storage time, the elevated pH (around 8.8) that will result when urea is converted to ammonia in undiluted urine, the ammonia concentration itself and higher temperatures.

What to do	Reason
Source separation	
The urine collection container should be designed with an overflow device with local soil infiltration.	To avoid the putrid smell of overflowed urine that could be a local nuisance



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<p>Collect urine separately from faeces.</p> <p style="background-color: #d9ead3; padding: 5px;">Source separation of urine is a strong barrier against pathogen transmission since most pathogens are excreted with faecal matter.</p>	<p>To allow its availability for use as a liquid fertilizer, to reduce smell, avoid fly breeding and reduce faecal cross contamination.</p>
<p>Storage & Treatment</p>	
<p>Prior to application, urine should be treated. Storage at ambient [same temperature like surroundings] temperature is considered a viable treatment option. As a rule: The longer storage, the better.</p> <p style="background-color: #d9ead3; padding: 5px;">Store un-diluted urine for 1 – 2 weeks in single households and at least six months for multiple households.</p>	<p>In order to sanitize it and reduce microbial health risks.</p> <p>If storage is not possible, then the fresh urine should be applied to tall standing crops, crops with a long crop cycle, grain crops and root crops processed and cooked. Examples of such crops are: banana, papaya, oranges, avocado, mango, cassava, millet etc.</p>
<p>The jerrycans or any other urine collection devices should be kept in a sun location where the sun hits all four walls of the jerrycan- days to weeks' storage.</p>	<p>High temperature is beneficial for pathogen inactivation.</p> <p style="background-color: #d9ead3; padding: 5px;">However solar heating should only be applied on collection devices that are airtight. The high temperature will enhance the loss of ammonia to the air if the collection device is not airtight</p>
<p>Urine should be stored in sealed containers. Jerry cans are the most common way of collecting urine, and a very good way for short-term storage.</p>	<p>In order to prevent direct contact with the urine.</p> <p style="background-color: #d9ead3; padding: 5px;">Urine has a distinctive smell/ odour. However, this is rarely a problem if urine is stored in closed containers. The smell is a signal that urine contains nutrients since ammonia smells strongly.</p>
<p>Dilution of the urine should be avoided during the treatment phase.</p>	<p>Undiluted urine provides a harsher environment for micro organisms, increases the die off rate of pathogens and prevents breeding of mosquitoes.</p>
<p>Application Techniques</p>	
<p>Urine should always be applied close to the ground. Do not apply urine on the edible or foliar (leafy) parts of vegetables as this can cause foliar burning.</p>	<p>This reduces direct contact with the edible parts of the plants.</p>
<p>Urine can be applied neat [un-diluted] or diluted with water. There is no standard recommendation for dilution/non-dilution and the existing recommendations vary depending on the local conditions. Levels of dilution can vary between 1:1 (1 part urine to 1 part water)</p>	<p>Dilution has the advantage of decreasing, or eliminating, the risk of applying urine at such high rates that it becomes toxic to the crop.</p>

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<p>and 1:15. Most common dilution ratios are 1:3 or 1:5. However urine should always be applied at the rate corresponding to the desired application rate of Nitrogen, while additional water should be applied according to the water needs of the plants.</p>	
<p>Urine should be applied in furrows and mixed with or watered into the soil immediately.</p>	<p>It minimizes the formation of aerosols, minimizes the exposure. Decreases ammonia loss through evaporation Minimizes smell/ odour. For best fertilizing effect. It limits potential health risks of direct exposure.</p>
<p>Application of fresh urine on arable land should not be done close to surface water sources in endemic areas.</p>	<p>To prevent further spread of pathogens</p>
<p>Spraying urine in the air should also be avoided. Use drip irrigation or a watering can.</p>	<p>To avoid nitrogen loss through gaseous emissions of ammonia and the hygiene risk through aerosols</p>
<p>Urine should be applied before or during sowing/planting</p> <div style="border: 1px solid black; background-color: #d4edda; padding: 5px; margin-top: 10px;"> <p>In areas where there is heavy rainfall during the cropping season, repeated applications of urine is an insurance against losing all the nutrients in one rainfall event.</p> </div>	<p>To give adequate time for a further die-off of potential remaining pathogens and thereby risk reduction.</p>
Crop restriction	
<p>When treated urine is used no particular crop restrictions need to be applied. However as an additional safety feature, the urine use may be restricted to non-food crops (e.g. cotton), crops that are processed (e.g. wheat) or cooked before consumption (e.g. potato) as well as crops/trees that allow for a minimum distance between soil and harvested part of the crop (banana).</p>	<p>To prevent spread of pathogens and further reduce risk.</p>
<p>The longer the time between application and harvest – the less risky. Thus for crops with short rotation times, like spinach and salad crops the risk will be higher, and the pretreatment should be better, but in the case of for example pineapples (rotation time 1-2 years) the risk is nonexistent from the urine.</p>	
<p>Note that urine should not be applied to nitrogen fixing crops, like groundnuts, peas and beans.</p>	<p>This may reduce the nitrogen fixing capacity and thereby the yield</p>

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Withholding period			
There should be one month between urine application on crops and harvesting. Don't apply urine less than a month before harvest on vegetables, fruits (except fruit trees) and root crops that are consumed raw.	To allow pathogen die off.		
General safe handling practices of urine:			
Safe handling of Ecosan byproducts operates on the principle of: reducing contact with the material			
Although there is no high risk associated with treated urine it is recommended that agricultural fieldworkers wear appropriate protective clothing (shoes & gloves) .	To reduce potential health risks.		
Careful hand washing with clean water and soap should be done after handling the urine.			
Only adults and not children should empty the chambers.	Children may fail to adhere to the hygiene rules.		
Use proper handling tools.	This is to avoid contact between people and urine and further reduce the spread of pathogens.		
Handling and transport systems should involve minimal contact with the urine.			
Clean the used equipment well afterwards.			
Hygienic food handling and food preparation practices e.g. washing and peeling (if possible) or cooking the harvested crops before consumption.	For disease vector intermediate control.		
Summary of safe factors in handling Ecosan by products			
Good pathogen reduction in latrine	+ Good post-latrine handling	+ Good hygienic behaviour	= Safe (ecological) sanitation

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