



Using Urine as a Fertilizer in Home Gardens: Frequently Asked Questions

Since the inception of Rich Earth Institute, we have heard countless stories from people using urine on home gardens, often with spectacular results. Though they may not realize it, they are continuing an ancient practice, as there is a long history of recycling of human urine as fertilizer. This document answers many of the questions that we are often asked about the use of urine as a fertilizer on the home-garden scale.

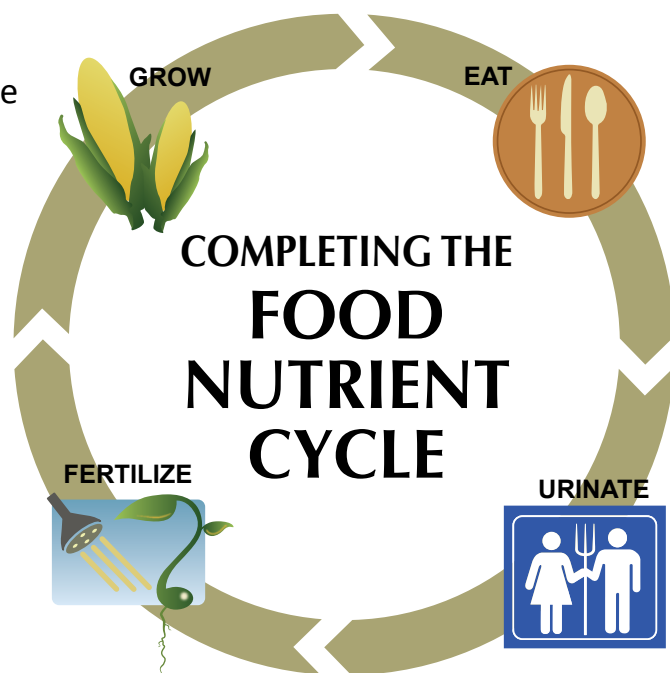
Which plant nutrients are found in urine?

Urine is used primarily as a nitrogen fertilizer, but also contains significant levels of other plant nutrients, including phosphorus, potassium, magnesium, calcium, and sulfur.

Do I need to sanitize my urine?

Many people use urine in their home gardens without any treatment. The World Health Organization recommends this practice if the urine comes from the same household that will be eating the produce, and if the following guidelines are followed:

- Wash hands after handling urine, or wear gloves.
- Apply urine close to the ground, not as a spray.
- If the crop grows above ground and is eaten raw, incorporate the urine into the soil by tilling or additional watering.
- Wait at least one month after fertilization to harvest crops that are to be eaten raw.



If the produce will be consumed by people outside the household, then sanitization is recommended. When sharing produce outside the household, we recommend transparency about the use of urine fertilizer (this document can be helpful when answering questions!)

Sanitization can be done two ways:

- Storing the urine in an airtight container at 68°F (20°C) or higher for six months (WHO guideline)
- Heating the urine to 176°F (80°C) degrees for 1.5 minutes (US EPA pasteurization method)

A new method of sanitization through sealed storage for 1 year at outdoor temperatures has been suggested by the Swedish EPA, but as far as we know, has not yet been tested or approved.

What's the best way to apply urine?

- Apply urine directly to the ground, as close to the ground as possible
- Pour gently instead of spraying
- Don't apply directly to leaves or stems
- Wear rubber gloves or wash hands after application

To prevent nitrogen loss, incorporate urine into moist soil by any or all of the following:

- Cover the urine with moist soil after application
- Dilute the urine before application
- Irrigate immediately after application or apply during rain

Recommended patterns:

- Apply 4" (10 cm) from base of annual plants
- Row crops: apply in a strip or shallow furrow next to the row
- Crops with space between plants: apply in a shallow hole next to each plant
- Trees: apply in a circle around the tree that is the same diameter as the tree's canopy.

Do I need to dilute my urine? How much?

If you follow the recommendations above and apply the correct amount, undiluted urine will not harm your plants. However, dilution can be beneficial because it helps the urine soak into the ground, especially in dry soil.

There is no standard dilution level; different sources recommend different levels. These range from 1:1 to 1:30. We often see recommendations for 1:3 to 1:5. Calculate and measure the amount you need before dilution, then add the desired amount of water.

When do I apply urine?

Apply during the time when plants are actively growing. This varies by crop, but it's generally after germination, and before fruits/seeds appear.

If possible, apply in several small applications spread out over the growing period, rather than one large application.

How much should I apply?

If you apply too little urine, your crops will not grow as well as they could. If you apply too much, the extra nutrients can wash out of the soil and cause water pollution. To avoid overapplying, you need to make sure that you don't add more nutrients (especially nitrogen and phosphorus) than your crops can use.

Many gardeners apply urine whenever they judge plants to be growing slowly or looking pale, applying about a gallon of urine per 100 square feet every couple weeks until the plants become more vigorous. This is very approximate, and while it typically results in healthy plants, it can be hard to know if you are applying too little or too much.

A better strategy is to calculate how much urine it will take to satisfy your crop's fertilizer needs, and apply that amount. A soil test from your state's extension service is inexpensive and very useful, and it will tell you how much nitrogen, potassium, phosphorus, and other nutrients you need to add to your soil for the specific plants you are growing. It will give you recommendations of how many pounds of each nutrient to apply per 1,000 square feet, and how often.

Because there is more nitrogen in urine than any other nutrient, use the nitrogen recommendation to calculate your application rate. If this amount of urine does not supply enough potassium or phosphorus, you can add compost, mineral fertilizer, or other fertilizer products.

Nutrient Content of Urine

Gallons of Urine	Nitrogen (lbs)	Phosphorus (P2O5) (lbs)	Potassium (K2O) (lbs)
1	0.05	0.008	0.017
2	0.1	0.016	0.034
5	0.25	0.04	0.085
10	0.5	0.08	0.17
20	1.0	0.16	0.34
30	1.5	0.24	0.51
40	2.0	0.32	0.68
50	2.5	0.40	0.85

Most recommendation rates are for the entire growing season, but it's best if you can split your urine application into several smaller applications while the plants are growing. So, don't forget to divide your total application amount by the number of times you plan to fertilize during the growing season.

Take care not to over-apply nutrients - doing so can harm your plants and the environment.

If you prefer to work with NPK ratios, the ratio for urine is approximately 0.6 - 0.1 - 0.2.

If I am using urine, do I still need to add anything else to my garden?

Since urine does not have a lot of organic matter, we recommend also adding compost, manure, leaves, straw, or other organic materials to your garden annually to build soil organic matter and provide additional nutrients.

Urine plus compost/manure will probably take care of most of your nutrient needs, but we recommend getting your soil tested every few years to make sure you have appropriate levels of all nutrients and pH.

How can I minimize odor?

Odor can be reduced by adding white vinegar to the urine collection container before any urine is added. We use 4 cups of white vinegar per 5-gallon container. Adding vinegar also helps retain nitrogen.

Adding vinegar lowers the pH of the urine, and this will affect the storage sanitization process. Vinegar addition should only be done if you do not need to sanitize the urine using the storage method.

Do I need to worry about salt accumulation?

That depends on where you are growing. Urine contains significant levels of salt, but this isn't generally a problem for outdoor gardeners in humid climates, including the eastern half of North America. In these climates, precipitation is greater than soil evaporation, and the rainwater/snowmelt will wash the salts down into the soil, away from plant roots.

However, if you are growing in an enclosed environment, like a greenhouse, or if you live in an arid or semi-arid region, salt is a potential concern. We do not yet have recommendations for using urine in these dry environments. If you want to try it, be sure to monitor your soil for salt accumulation. If salt becomes a problem, you can flush the soil with water to correct it.

Will urine affect the pH of my soil?

We have not yet tested this ourselves, but the literature suggests that applying urine at appropriate levels will not have a significant effect on soil pH. Overapplying could lower the soil pH.

If you have added vinegar to your urine, the vinegar will biodegrade once you apply it to the soil, so it does not have a long-term effect on soil pH.

Can I sell produce from my garden?

The Food Safety Modernization Act, and other federal, state, or local regulations may restrict the sale of some crops fertilized with urine. Be sure you are in full compliance with all relevant laws and regulations before selling crops grown with urine fertilizer.



What are your experiences?

Have you used urine in your home garden? What methods have worked or not worked for you? What questions do you have after reading this document? We would love to hear about your experiences! Contact us at info@ricearthinstitute.org

Rich Earth Institute is not responsible for misuse or mishandling of urine fertilizer. There is some risk present in handling human waste, and safe use of urine as a fertilizer is the responsibility of the user.

Additional Resources

Practical Guidance on the Use of Urine in Crop Production

Stockholm Environmental Institute (2010)

A great summary of current recommendations on urine fertilization, based on research in Europe, Central America, Africa, and Asia.

Also available in French and Spanish.

<https://www.sei.org/publications/practical-guidance-use-urine-crop-production/>

Urine diversion – hygienic risks and microbial guidelines for reuse

Caroline Schönning, Department of Parasitology, Mycology and Environmental Microbiology Swedish Institute for Infectious Disease Control (SMI) (2001)

This document describes guidelines for use of urine as fertilizer as well as risk assessment of different aspects of the process. It is the basis for the World Health Organization guidelines.

https://www.who.int/water_sanitation_health/wastewater/urineguidelines.pdf

Urine Diverting Toilets in Climates with Cold Winters

Stintzing et al., Women in Europe for a Common Future (2007)

A helpful guide for collecting and reusing urine in areas where winter temperatures dip below freezing.

http://www.wecf.eu/cms/download/2007/WP-26_web-07.pdf



Learn more about the Rich Earth Institute:

<http://www.richearthinstitute.org>