

## Remember

1. Do not add water to residues in the shelter, as decomposition of the rachis alone will generate lixiviates.
2. Pour collected lixiviates over the pile of rachis to dampen them. Repeat this action 2 or 3 times a week to accelerate decomposition and thus obtain a higher volume of lixiviates.
3. Increase the volume of rachis in decomposition by adding, every fortnight, new rachis to ensure a constant volume of lixiviates.

## Storing lixiviates

Because they are highly corrosive, store lixiviates in lidded or capped plastic containers, not metal ones (Figure 6). Leave the lixiviates to rest, or cure, for at least 30 days before use.



Figure 6. Lixiviates stored in plastic containers.

## Research

A 3-year study evaluated plantain rachis lixiviates under a production protocol on farms in Quindío (Colombia). The population of *Ralstonia solanacearum* (causal agent of Moko disease) was successfully reduced by 32%, using applications of pure lixivate on soil at 27,000 L per hectare.

Aerial applications of lixivate at 20% concentration led to improved leaf development, with plants presenting as many as three healthy leaves at harvest. Black sigatoka infection (caused by *Mycosphaerella fijiensis*) was also less severe.

Lixivate quality is determined by production protocol and time, curing, and the amount of fertilizers the plantain crop had received. This last influences rachis quality and therefore lixivate quality.

Compared with fresh lixivate (less than one year of production), mature lixivate (more than one year of production) has higher concentrations of organic acids (e.g., citric, malic, and succinic acids) and minerals (Figure 7; Table 1).

The use of mature lixiviates reduces incidence of both Moko disease and black sigatoka.

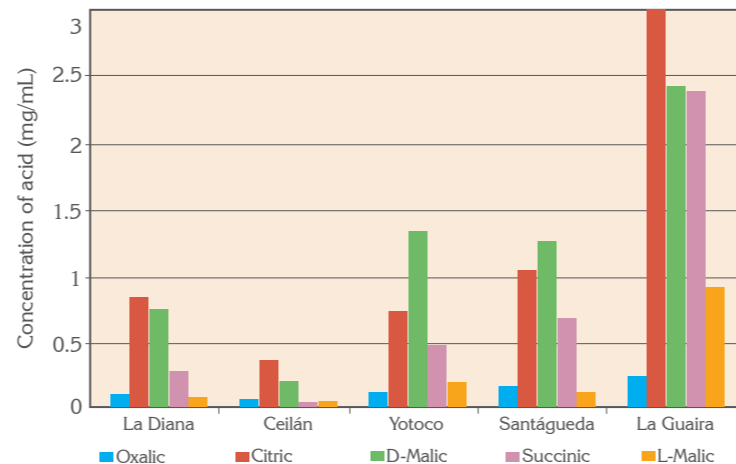


Figure 7. Lixiviates from five farms, Quindío and Caldas, Colombia.

### For more information

**Elizabeth Álvarez, Ph.D., Plant Pathologist**  
International Center for Tropical Agriculture (CIAT)  
Km 17 Recta Cali-Palmira, Valle del Cauca, Colombia  
Phone: +57 2 4450000 Ext. 3385 – E-mail: e.alvarez@cgiar.org

### Alberto Pantoja, Ph.D.

Regional Plant Production and Protection Officer  
FAO–Regional Office for Latin America and the Caribbean  
Phone: +56 2 9232295 – E-mail: alberto.pantoja@fao.org

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# Producing Lixiviates from Plantain Rachis in the Colombian Coffee Belt



Elizabeth Álvarez, Alberto Pantoja, Germán Ceballos and Lederson Gañán



## The importance of using rachis

In the plantain or banana plant, a rachis is the stem that bears the inflorescence or bunch of fruits. At harvest, rachis become underused residues, being scattered among the plantation's harvesting points. But these crop residues can be taken advantage of, as part of a scheme for eco-efficient agriculture.

Plantain rachis can be used to produce lixiviates—liquids produced by decomposing plant materials—to manage certain plant diseases and also use as supplements in leaf and soil fertilizer applications.

Lixivate production is carried out in a *ramada*, which is essentially a compost trough protected by a rustic shelter. The shelter stores and protects rachis during their decomposition and has the means to siphon off and collect the liquids produced (Figure 1)

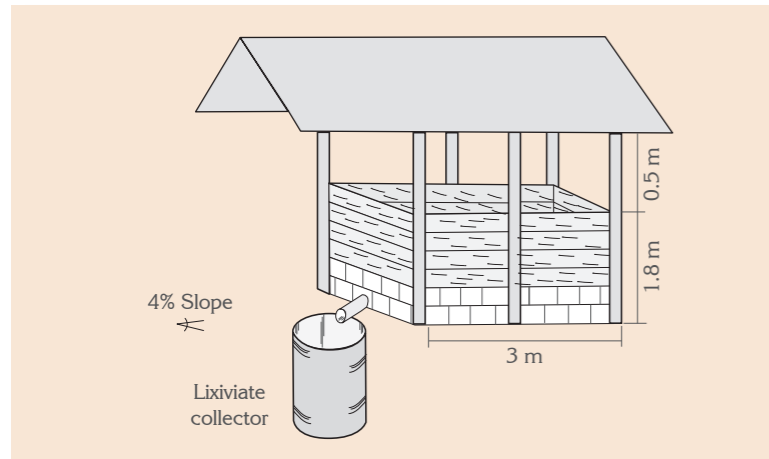


Figure 1. Construction diagram of a ramada or compost shelter for producing lixivate from plantain rachis.

## Building a shelter

The shelter should be located close to the harvest points to avoid transporting rachis over long distances. The size and number of shelters depend on the quantity of rachis produced on the farm. For construction, available materials should be used such as building bamboo, taking into account the following:

- The floor is mortared and covered with a layer of waterproofing. It has a central slope of 4% (Figure 2) to ensure that lixiviates drain towards the collecting container.



Figure 2. Floor surface of a rachis compost shelter.

- A 2-inch PVC pipe is connected to the floor where the lixivate drains out. It has a plastic grille to prevent large particles from passing through. The pipe leads to a 200-L plastic container that is buried into the ground to collect the lixivate (Figure 3).



Figure 3. Drainage pipe and collecting container.

- To prevent lixiviates leaking through the structure, the walls are first built in adobe bricks or concrete and continued with either building bamboo (protected on the inside with plastic) or concrete.
- A roof covers the shelter, the pile of decomposing rachis, and the lixiviates produced (Figure 4). The area must be protected from rain and runoff.



Figure 4. Walls and roof of the compost shelter.

## Obtaining lixiviates

Rachis of recently harvested bunches are selected, discarding those showing symptoms of Moko disease. The selected rachis are then chopped into pieces and placed in the compost shelter (Figure 5).



Figure 5. Rachis stored inside the shelter.

The rachis then begin decomposing through the action of microorganisms, releasing a dark liquid known as lixivate or leachate. This liquid contains partially decomposed organic matter and beneficial microorganisms, and has high nutrient content (especially potassium) (Table 1).

Table 1. Chemical analysis of plantain rachis lixiviates, produced over more than one year.

Farm	Elements in lixiviates (mg/L)												
	pH	N	P	K	Ca	Mg	S	B	Fe	Mn	Zn	Cu	Na
La Diana	10	288	268.9	22.428.6	48.5	18	342.7	1.2	4.3	2.8	0.4	0.6	27.2
Yotoco	9.7	307.5	174.0	16.358.4	28.5	28.9	125.8	1.3	7.7	nd	0.4	0.5	30.1
La Guaira	8.58	205	187	15.588.0	64	43.4	55.7	0.12	0.5	0.51	0.06		