How to Make EM1 Effective Microorganism: 3 Recipes

To make your own EM1 without buying store-bought solutions, we need to find the microbes, create a little house to keep them & mix some food to keep them alive and happy. Today, we'll share with you 3 recipes for making your own homemade EM for cheap and for longer uses. Let's explore together!

Brief Benefits of EM

The EM microbes have been found to be very effective in improving soil conditions, even for the most lifeless and clayey soil in some areas. By using EM, growers rely less on undesirable pesticides or other chemical stuff. People have seen their fruits, veggies and flowers grow stronger & produce 2x the size of the normal ones with some of this EM stuff mixed in.

In chicken coops, piggeries, fish ponds or pet litter, these microbes can help reduce the foul smell. And for composting specifically, EM works like a charm by keeping the smell down and speeding up the composting process. In some places, they purify water with this solution for cost reduction. Magical as it may sound, EM is as simple as it can be. It's very easy and cheap to make as the microbes exist mostly everywhere around us.

Let's see some of the basics so you can make your own at home:

The Basic Conditions

As you've seen earlier, there are about 3 basic conditions to cultivate EM:

1. The microbes
2. The house
3. The food

Fortunately, to find these microbes you can easily look around your local markets or right in your kitchen. Microbes live on the outside of grains, fruits, veggies, etc. For our experiment today, we'll be using rice grains to collect them.

The house to keep them can be a mason jar with a lid so we can easily offgas the CO2. Also, for the water in the solution, we'll use de-chlorinated water as chlorine water could kill off the bacteria we're harvesting. Warm water around our body temperature is best to keep the little microbe ones happy.

Finally, we need a food source for the microbes. For this, you can use salt, sugar or minerals. Sea salt will give the microbes the minerals whereas sugar will give them the carbohydrates. You can also add ceramic powder, rock powder, azomite to add some calcium & other minerals to it. Milk and kelp are also good sources of food for these guys.

The Good Bacteria We're Cultivating

Although in most lab-made EM there are different species like lactic acid bacteria (LAB), yeast and photosynthetic bacteria, we'll mostly be cultivating LAB in our solution. Even with little of the other species, folks have also got very good results with using the LAB-dominant EM for their compost or garden.

Initially when we start our batch, there will be more than just one type of bacteria in it. However, when we keep our solution in a dark place (as you'll see in the making steps next), the LAB will become the dominant specie–which it still is in many lab-generated EM.

Speaking of different types of bacteria, I am experimenting with some home-cultivated photosynthetic bacteria (PSB), one of the components of EM. Waiting to see the results.

>> Link Blog post: How to make PSB photosynthetic bacteria at home

Enough of the theory & let's get our hands to the chopping next!

Recipe #1: Only Rice

(~ 7 Days, No Electricity Required)

For this recipe you'll need rice and some additional food for the microbes:

For 1.5 liter bottle	**For 6 liter bottle**
150 gram brown rice	600 gram brown rice
15 gram sea salt	60 gram sea salt
45 gram brown sugar	180 gram brown sugar
1500 ml mineral water	6000 ml mineral water

This recipe is shared by Healthy Roots & Strong Winds during their exploration time in Thailand. The work is mostly inspired Master Cho & his dedication to natural farming techniques.

Please also note, 1.5 or 6 liter bottle is usually designed with an empty space from the shoulder to the bottle neck, so you don't have to worry about overflowing or CO2 bubbling the contents out.

From here, many people also ask:

Why Brown Rice, Brown Sugar and Sea Salt?

What we're trying to do here is to gather all the good guys we can on different materials. Brown rice, red rice or brown sugar still has the unprocessed coatings on the outside. These coatings contain extra vitamins & minerals that can be beneficial for our process.

Brown sugar, from some people's experience, contains some more nutrients than the white one–which helps the nourishment and makes the process a bit faster. With good input, we can get good output in return.

However, if you can't find brown rice, brown sugar or pink sea salt (also called Himalayan pink salt) or Celtic salt in the local area, that is okay. Using white rice, white sugar or table salt still works. We will get a different dynamic of microbes in our mix.

Here we will see the steps for making:

Step 1: Mix the Ingredients

Using lukewarm water, mix our salt and sugar in a jar or bottle. Stir lightly so they get dissolved. Then, pour the brown rice in. And then, shake the bottle.

When shaking, you'll want to do it like the number 8 vertical or the number ∞ horizontal like a tornado. This is to make sure the grains grub well with each other on all sides & not just left and right.

This helps to get the coatings & the LAB living on them to come out and mix with our water solution. You don't need to strain the rice grains out after shaking.

Step 2: Keep Bottle in a Warm Dark Place for 7 Days

After mixing & shaking, close the lid and place your bottle somewhere dark and warm for about 7 days. Around body temperature would be great. Keep it out of direct sunlight because the UV rays can kill the microbes.

And then we can:

Step 3: Strain the Liquid From the Rice & Enjoy

Every day or so, check your bottle to see if there's any air bubbles building up. Open the lid slightly to let the CO2 gas out. Then, after a week or 10 days, strain the liquid out and you'll have your very own army of EM solution to use. With the remaining rice grains, you can dump them into the compost bin.

In colder climates, it may take longer so remember to keep the bottle somewhere warm or wrap blankets around it for the microbes to remain active. And with this recipe, you can make & reproduce your own EM at home.

There is another way to make EM, and this time we'll be using both rice and milk:

Recipe #2: Rice & Milk

(~ 7-14 Days, No Electricity Needed)

For this recipe, we'll use rice and milk:

Rice-milk LAB
1 cup brown rice
2 cups water
Organic milk

Step 1: Mix the Rice & Water

Mix the rice into water. Then shake the bottle until the liquid turns a bit brown. Then, you can strain off the rice. The rice we use is uncooked and white rice is also fine.

Figure 1: Step one: Wash the rice

Pour the rice wash into a container, leaving about 3/4 head space. It will leave space for the beneficial microbes in the air to come in and multiply.

Step 2: Keep Bottle in Warm Dark Place Until It Has a Slightly Sweet-Sour Smell

Then, let the bottle sit in a warm dark place for about a week. Place a breathable cover (like napkin, coffee filter or paper towel. I switch from one-time-use napkin to using breathable reusable sink filter for mine) on the top to let the CO2 air out and invite the good microbes in. After some hours or days, the LAB in our mix will grow in number.

For the first few days, if you have a quick sniff, the solution will have a mildly sweet smell that's also kind of starchy. If you're using some breathable cloth cover and rubber band, make sure it's not too aromatic. Or else it could be mixed with the rice smell making it harder to tell if it's ready.

When you place your ears near the top, you'll hear some little fizzing and sizzling. At times, there may be bubbles at the top. The smell may differ slightly depending on the type of rice you're using.

An example, this is the rice wash after 1 day:

Figure 2: The rice wash clears up after 1 day

Watch out for some yellow stuff forming near the top:

Figure 3: Fermented rice wash after 7 days

I'm not sure if this is a kind of mold or something. But it smells quite bad. Quite frankly, it smells like fart. From a YouTuber's info that I asked, this doesn't matter and it still contains good bacteria. You may want to scoop out the yellow part.

Depending on how hot or cold your area is, you can pour out this fermented rice wash sooner or later. It doesn't have to be a fixed 7-day period.

Let your nose be the guide. Have a quick sniff of the stuff, if it smells slightly sweet-sour and you feel that it's just right, take out some and use it in the next step. For me in this current weather, about 12 hours is good enough.

When that's done, we can move on to:

Step 3: Mix 1 Part LAB to 10 Parts Milk

As you may have noticed with this recipe, we provide no salt or sugar for the microbes from the beginning. So this is when our little creatures are craving for food. If we mix the LAB in milk when they're most hungry, they take the opportunity fast & reproduce quickly.

Milk contains good carbohydrates for the little guys to munch on. Mix in 1 part LAB to 10 parts milk. Leave the LAB-milk mixture in a warm dark place. Then, after about another week or less, you'll see some solid curd forming on the top. That is the fat + casein protein separated from milk. You don't have to throw that away. You can actually keep it to make cheese.

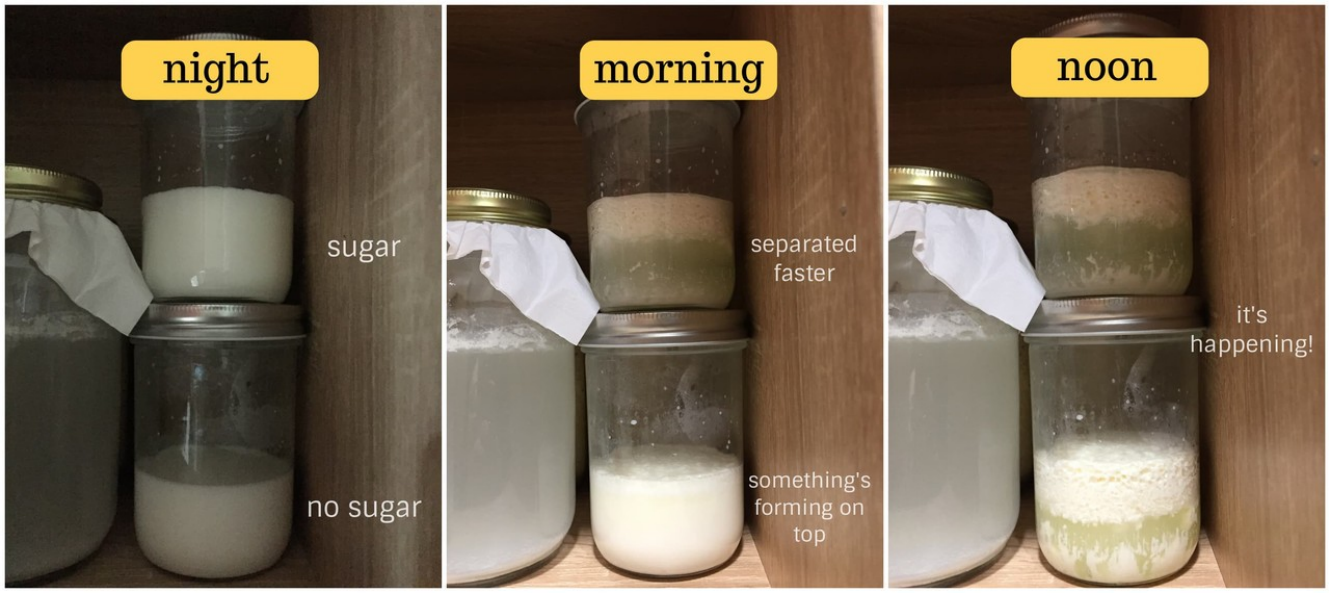

Figure 4: Happening of milk to curd and whey with LAB added

And the yellowish-brownish liquid under the curd is the whey, which now houses millions of good LAB microbes for us to use. You can scoop the curd out on top then pour out some of that liquid whey in a container.

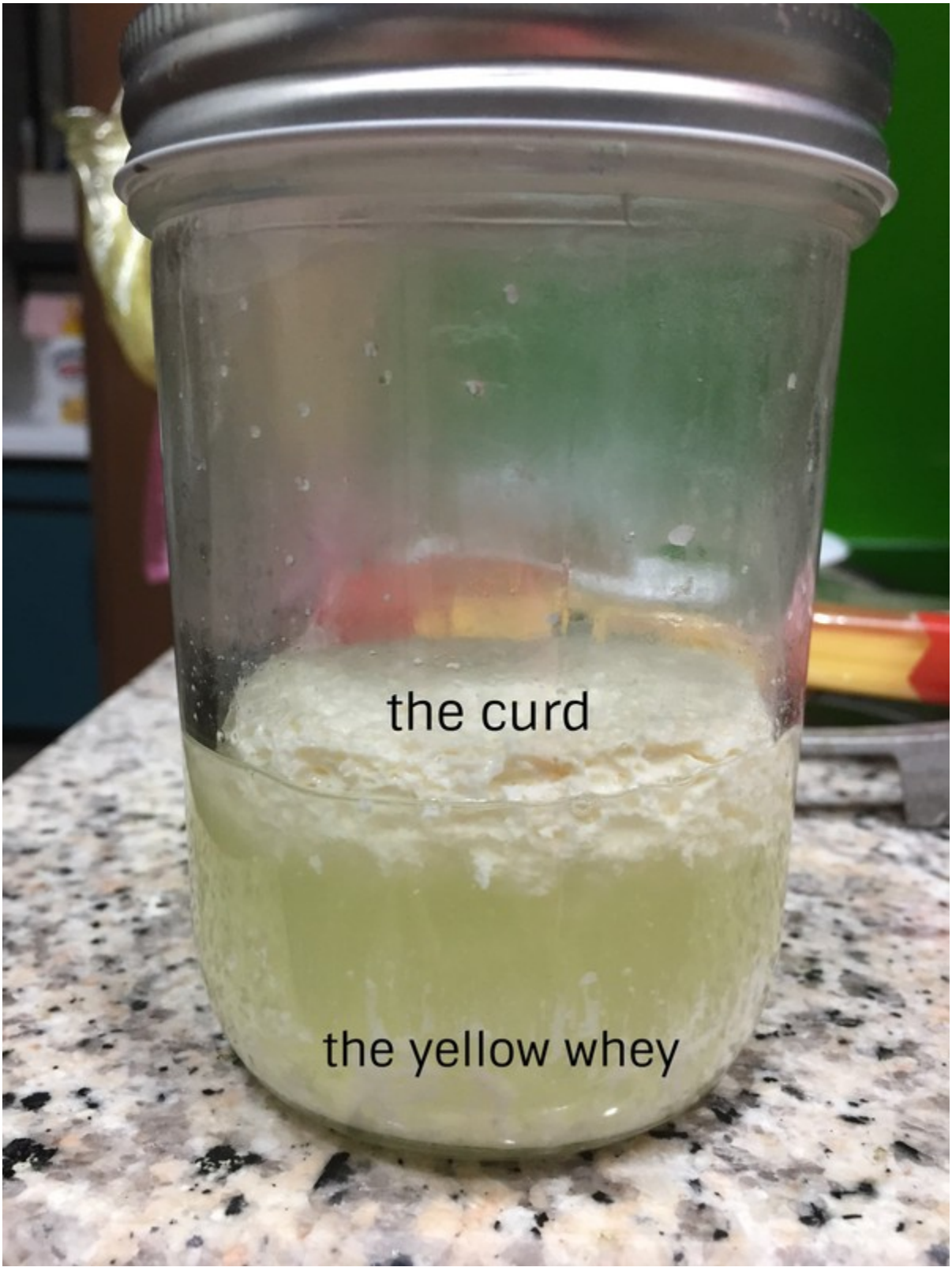

Figure 5: The whey is the stuff we want (with thousands of good microbes)

I extracted out the whey liquid and mix it with water (1:10 ratio) & put it in a little spray bottle.

Figure 6: I guess we can call this a basic homemade EM

Some folks add some extra Yakult drinking yogurt (with live *Lactobacillus Casei* gut bacteria) to this whey mixture for a double-shot concoction with hopefully double the power. I haven't tried it but you

can try it if you like.

You can use this mix to fertilize the plants or spray around the compost bins. I mist it in my bokashi composting bucket, a bit around my dragon fruit cuttings & adenium seedlings. Works great from what I've seen so far.

Figure 7: Spraying basic EM1 in bokashi bucket

I've been using this stuff for my adenium plants, you can see how beautiful they've grown here ^^ (yeh yeh yeh):

Figure 8: Adenium one month old with some EM

Especially if you apply it during the active growing season (with good sunlight & water), the plants grow up fast and strong.

Finally, if you want a one-ingredient recipe, how about checking out the last recipe with:

Recipe #3: Only Milk

(~ 1 Night, Some Electricity Needed)

With this final recipe, we're doing something different. Let's make some yogurt! Why? Because we want the whey or the yellowish liquid of the yogurt making process. Skipping all the other steps of mixing in salt, sugar & minerals, this is one simple way to get your own good microbes at home. And some yogurt for the kids.

If you don't know how to make it yet, let's see the steps below:

Step 1: Heat 1 Gallon of Milk

Heat 1 gallon (about 4.5 liters) of milk up to 180F (82C) for about 10-30 minutes.

Step 2: Reduce the Heat & Add Yogurt Starter

Then, reduce the heat of the milk to 43C (110F) and add your yogurt starter. About a tablespoon or so of starter would be good enough.

A yogurt starter can be simply some store-bought yogurt to get your batch started.

If it's too hot when we pour some yogurt starter in, the bacteria may die. So we need to reduce the heat.

Step 3: Keep it Warm For 7 Hours

Keep your batch at around 43C (110F) for the next 7+ hours. Then, when the milk sets (turns into a solid state), pour out the yellowish whey underneath.

With that whey, you can use it directly to spray around your compost bins or dilute it to fertilize your plants. And with that, in about a night, you'll get your own easy homemade EM solution ready for use in the garden.

If you'd like to stabilize and store your EM for longer usage:

Extra Step: Stabilizing and Storing Your EM

EM can be good for up to 3 years in the fridge. To store it at room temperature, you could mix in a 1:1 ratio of molasses or brown sugar to the made EM. For example, if you have harvested 500 ml of EM, then mix in 500 ml of molasses.

From a test of one maker, the molasses-mixed EM stored at room temperature can be good for up to 2 years. The time point at which they tested its viability again with a simple way like this:

To Test if EM Is Still Active After Years

You can take out some made EM (stored in molasses), then mix:

- 30ml made EM
- 30ml molasses
- 1L water

Add some molasses to the made EM, then mix them in water. Then, in a kilo of rice bran (very cheap in places), add 500 ml of the EM mixture. You could alternatively use old newspapers as the 'carrier'.

Here, mix the bran so it is well moist all around. When you squeeze some rice bran in the hand, it should form in shape nicely without excess water dripping out. This is when it is moist enough.

Then take some bran out and store in an airtight (little oxygen) box. Sit the box in a warm dark place. After 3-7 days, take it out and have a look inside. If the inside has developed some white mold on top, then congrats your EM is very much active and alive. The process we just did is also known as 're-activating' or 'refermenting' the EM.

In places with changing hots-n-colds (like an air-conditioned room turning on and off) or when some humidity gets inside the box, there may be some green mold developing with the white one. If the tested sample is good, then the rest of your batch can still be used as bokashi bran.

We have a bokashi bran guide here if you're interested:

>> Link Blog post: How to Make Bokashi Bran

Using EM for Plants

Figure 9: Spraying EM micro-greens

With this stuff made, you can mix about 6ml per 1L water for spraying. Or about 3-4 teaspoons per gallon to spray your plants.

And that's all there is to it!

Have Fun Making Your Own EM

As you have seen, making your own EM mix at home is both fun and easy. With the Only Rice recipe, you can add some salt and sugar amount with the rice to feed the microbes.

With the Rice & Milk recipe, you only need rice and milk and not much of the salt and sugar. And finally, with the Only Milk one, you're getting the real essence from the milk without much addition.

Hope these little recipes have given you some ideas to get started. Have fun making EM & have a great time composting. Cheers and See you again here next time!

>> Link Blog post: How to Make Nitrogen Rich Liquid Fertilizer with EM