

An Interpretation of:

# Recycling Solid Waste from the Olive Oil Extraction Process

RIRDC Pub. No. 08/165

Completed by John Barton

Director – Charton & Bang

CHARTON  
& BANG



## **Document Contents**

In 2007 the former Rural Industries Research and Development Corporation (RIRDC), now known as Agrifutures Australia, released a paper about composting olive mill waste (OMW) in Australia. They ran a trial to learn if it was practical and possible for an olive producer to compost OMW themselves. Composting the OMW would have the dual benefits of removing the problems associated with OMW and creating a product beneficial to spread back in the olive orchard.

### **The Problem**

OMW can be a pain. Nobody wants to take it away, and if you leave it sitting around it takes up space and starts to smell. The authors of this paper decided to see if they could come up with a practical way to process OMW on farm using readily available tools and ingredients.

The simplest way to deal with OMW is to spread it back in the orchard without treatment. Unfortunately this can cause problems, as raw OMW contains two compounds that can be toxic to plants and microbes. These two compounds are phenols, and volatile fatty acids (VFAs).

Phenols are a group of chemicals that are found in plant materials that have strong taste or smell (such as eucalyptus leaves or olives). Strong tastes or smells are often the result of plant defences against grazing animals or microbes. Unsurprisingly then, if you remove the oil and water from olives the concentrated chemicals left behind can be a problem to tender plant roots and soil microbes when applied to the soil in an orchard.

VFAs can be produced from any plant or animal material that can easily be broken down by microbes. Leaves, fruit, oil and seeds in piles with enough moisture will get broken down by microbes. In the early stages of this process VFAs are produced. They are an important part of the breakdown process, but when present in large quantities they can kill plants. Applying still rotting organic waste to the soil can introduce enough VFAs to cause damage.

### **The solution**

Both phenols and VFAs are organic molecules that can be broken down by microbes given time and the right conditions. They do not contain toxic elements, they are made of the same carbon, hydrogen, oxygen and nitrogen as all living things. They can be broken down and rebuilt into non problematic compounds. Composting is the perfect process for doing this. It involves optimising conditions for microbes so that they can rapidly and reliably transform organic materials into safe and highly beneficial humus. This paper proposed that composting is highly suitable as a treatment method for OMW that can be done on farm with existing resources. The trial described in this paper set out to show that composting is a viable method for removing phenols and VFAs from OMW.

### **The Trial**

The trial involved using a farm front end loader to mix several batches of compost. The composting was done according to the normal aerobic composting method. The batches were made with OMW from 2 and 3 phase processes, chicken manure and wheat straw. Woodchip from olive orchard prunings was used for one batch, but the results weren't shown. The ingredients were mixed together to achieve a carbon to nitrogen ratio of between 25:1 and 35:1, the ideal composting range. Water was added to get to

approximately 50% moisture in the compost piles. The piles were cone shaped, and were mixed every two days by front end loader. The piles were composted for up to 80 days. Tests were done on samples from the piles at various times during the process.

### **The Results**

The trial showed that the two compounds that could be damaging to plants were reduced to safe levels by composting. Phenols were reduced by 75% after 80 days of composting. The VFAs at the end of composting were not measured, but they are reliably removed by the composting process. The fact that the composting process was successfully performed was demonstrated by measuring that there was a good level of humates and humic acids in the compost, a reliable indicator that the process of microbial decomposition has been completed.

Plant Toxicity tests were conducted as a practical measure that the OMW was no longer toxic to plant roots. This test is performed by germinating cress seeds on the finished compost and a potting mix for comparison. The length of the roots is measured to find out if the OMW compost restricted root growth or germination. In this case the composted OMW had generally greater germination than the potting mix and had nearly twice the root length of uncomposted OMW.

High enough temperatures were reached during the composting process to ensure that any pests and diseases in the ingredients brought onto the farm were removed.

### **The Shortcomings**

The paper only described the bare minimum about how the composting process was performed. Further advice would need to be sought before incorporating this into your farm practices. It is definitely possible and practical to do as part of an olive orchard and olive pressing operation, provided some knowledge of composting is gained first.

The budget wasn't very accurate for real world conditions. It left out labour, fuel and water costs, but it also used prices for purchased ingredients at garden centre prices. They can be purchased significantly cheaper in bulk. Once labour, fuel and water are added in and more realistic ingredient prices are used, the total price of \$50 per tonne of compost produced may be close to accurate.

No real testing was done to see whether OMW compost is actually beneficial to soil and plant health when used in an olive orchard. The majority of the tests performed were simply to demonstrate that OMW is no longer actively harming soil microbes or roots. There is however plenty of other research around the world demonstrating that compost and composted OMW specifically is beneficial to olive orchards. This research will need to be consulted to find appropriate application methods and rates.

### **The Benefits**

This paper shows that composting will remove the two main downsides of applying raw OMW back into your orchard. Composting reduces phenols and VFAs to below problem levels. This prevents OMW from causing damage to soil microbes and plant roots that will reduce the ability of your trees to get water and nutrients and therefore limit yield.

The compost produced from OWM can have great benefits for your soils and plants. Good quality humified compost has been shown elsewhere to increase soil water holding capacity, increase the

nutrient efficiency of soil, recycle nutrients from wastes, increase the quantity and diversity of soil microbes, suppress soil and plant diseases and supply nutrients. All of these benefits should lead to increased yield and reduced input costs, which equal greater profitability. This paper claims that using the compost that they produced it would cost \$125 per hectare to supply the same amount of nutrients as a \$208 per hectare budget for chemical fertiliser supplied via fertigation.

However none of these benefits were tested in this trial. All that was specifically proven was that the finished compost was not toxic to plants. That being said, the research done elsewhere on using composted OMW shows that you can be very confident that it will have positive effects in Australia.

### **The Outcomes**

The main outcomes of this paper are to show that composting OMW in Australian conditions is physically and practically possible, and that composted OMW will not harm soil microbes or roots. This makes composting a viable and cost effective method of treating OMW, with the added benefit of creating compost that will improve the health of your soils and trees.

All producers of OMW should consider composting their waste, and definitely avoid spreading raw OMW back in olive orchards. If you do decide to investigate composting, it is a very good idea to consult some composting resources and try to find a hands-on composting course to build your skills. Composting is very easy when it is going right, but a pain to fix when it goes wrong if you don't know what to do. You don't have to use the exact ingredients described in this paper, other types of manure or carbon sources could easily be used, depending on what is local to you. Using olive prunings is recommended as an on site zero purchase price option.

If you aren't able to make your own compost, or can't make enough to fulfill the needs of your orchard, the national composters association, AORA, have a list of commercial composters across Australia at <https://www.aora.org.au/find-a-composter> .