Central Agricultural Resources Marketing and Energy Network

FAQs on biowaste bags

Questions & answers on compostable plastic bags for biowaste collection

Bayerisches Staatsministerium für Wirtschaft, Landesentwicklung und Energie
Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten

C.A.R.M.E.N.

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Introduction

Separately collected biowaste is a valuable resource for the generation of renewable electricity and heat as well as high quality fertilisers and soil improvers in anaerobic digestion (AD) and composting plants. In Germany, just over 4 million tonnes of kitchen and garden waste (biowaste) are now collected from households via biowaste bins, and the trend is rising.

To continue this success story and meet the strict legal requirements for compost quality under the German Biowaste Regulation (Bioabfallverordnung) and the law on fertilizers, thus maintaining confidence in the AD and composting industry in the long term, contamination in the end product must be kept to an absolute minimum. This applies especially to plastics, which spoil the appearance of compost and contribute significantly to spreading microplastics in the environment.

One way to make cleaner compost is to use compostable plastic bags for biowaste collection.

Here we provide some background information about these bags.

How quickly do compostable plastic bags for biowaste collection decompose?

In an industrial composting process, compostable plastic bags degrade as quickly as they need to in practice in order to produce finished compost – that is to say, **within the standard composting cycle of the most common systems** [1]. Compostable plastic bags have been optimised for these composting times.

If non-sieved compost containing not completely degraded compostable film residues is added to soil, the degradation process continues in the soil and the film residues are converted into carbon dioxide, water and biomass, just like biodegradable mulching films at the end of cultivation after tillage [2].

According to DIN EN 13432, compostable plastic bags must show a minimum of 90 % biodegradation (conversion to carbon dioxide). What happens to the remaining 10 %? Do they remain in the soil as microplastics?

Just as humans digest food and exhale carbon dioxide, microorganisms use compostable plastic bags as food and convert them into energy and building blocks for their growth and reproduction. Carbon dioxide and water are produced during this process. The compos-

table plastic bags' decomposition can thus be verified in the laboratory based on the amount of carbon dioxide that is generated. This is also a requirement of the DIN EN 13432 standard.

The reason that compostable plastic bags are not 100 % degraded to carbon dioxide is that microorganisms convert part of their food (the decomposition products of the bags) into their own biomass. The same happens when microorganisms use natural feedstock such as biowaste or cellulose.

- → Compostable plastic bags are therefore **100 % biologically converted**.
- → **Carbon dioxide** and **water** are produced, as well as **building blocks** and **energy** needed by the microorganisms.
- → **No microplastics** are left in the soil.

Is only the renewable portion of compostable plastic bags degraded?

No, even the synthetic building blocks of the compostable plastic derived from fossil raw materials are degraded by microorganisms and turned into carbon dioxide, water, energy and biomass [2]. Microorganisms don't care about the renewable or fossil based origin of their food, they care only whether it contains energy and building blocks that can be exploited for their growth and reproduction.

According to DIN EN 13432, complete biodegradation must be demonstrated for every single component of the compostable plastic bags.

What else does the compostability standard DIN EN 13432 require?

This standard not only specifies how the complete biodegradation of film bags must be tested – it also needs to be proven for every single component of the film material. The tested raw materials must be just as biodegradable as a natural material, like cellulose.

Another requirement is that after 12 weeks of composting, 90 % of the compostable plastic bags are decomposed to particles smaller than 2 mm. Thus, **no more film residues would visually affect the compost**. In field tests, significantly shorter decomposition times were demonstrated [2,3,4].

Last but not least, a plant germination and growth test must show that the **quality of the resulting compost is not adversely affected** by the addition of compostable film bags. Or to put it another way: the compost must not have a negative impact on plant germination and growth.

Why does the compostability standard DIN EN 13432 specify a 12-week composting period for certified products?

When the DIN EN 13432 standard was developed, open windrow composting was the standard method for decomposition testing.

Compostable plastic bags commonly available on the market, such as those offered by retailers and some local authorities in Germany, are only about 0.02 mm thick (20 microns). However, film material of a much greater thickness – e.g. 0.1 to 0.2 mm – is usually being tested during the certification process [5, 6]. This means that a much thinner bag is degraded in a much shorter composting time than the 12 weeks specified in the standard [1].

How do Germany's neighbouring countries deal with biowaste bags certified to DIN EN 13432?

These bags have been tested in various composting plants throughout Europe and are recommended for use by local authorities and composters in many countries, such as Switzerland, Austria, Denmark, Belgium, Italy, Spain and France.

In Germany however, many operators of composting and AD plants are extremely concerned about compostable plastic bags (e.g. that they might not decompose fast enough and thus visually affect the compost). This is despite the fact that compost is produced by similiar technology, whether in Germany, Italy or Austria.

How do you identify compostable biowaste bags that have been tested and certified according to DIN EN 13432?

From the **seedling** logo printed all over the bags. It is a protected trademark and its misuse will be prosecuted. This distinctive logo makes it easy for all interested parties – citizens, municipalities and composters – to identify compostable biowaste bags (see Fig. 1).

Fig. 1: Seedling logo.

Do compostable plastic bags also degrade during fermentation?

Fermentation, i.e. decomposition without oxygen, involves different microorganisms to those which are active during composting. They are less good at digesting compostable film bags. However, various tests have shown that the native starch component contained in some compostable plastics is readily biodegraded even under anaerobic conditions. Using suitable processing technology, the biowaste contained in the bags is made available to the fermentation process. The bags themselves are then completely degraded in the post-composting phase [3].

What added value do compostable plastic bags offer compared to newspaper or paper bags?

Waste characterization analyses show that many people like to collect their wet kitchen waste in a plastic bag in order to keep the kitchen bin clean and make it easier to throw the waste into the biowaste bin. With paper bags and newspaper there is a higher risk of leakage and tear in the kitchen caddy or during transport to the outdoor biowaste bin. Allowing citizens to use compostable plastic bags, or even providing them to the householders, increases the motivation to collect biowaste separately in the kitchen (see Figs. 2 and 3) [4].

Who likes to rinse out a dirty, possibly foul-smelling biowaste kitchen bin week after week in the sink or basin because they don't have a garden where they can deal with it? It's easier to take the (compostable) film bag full of waste out of the kitchen bin and take it to the biowaste bin.

That is why compostable plastic bags are becoming more and more popular in private households. Relevant studies have also shown that forbidding people to use compostable bags, increases the use of conventional plastic bags that do not biodegrade and significantly reduce the quality of the compost [7].

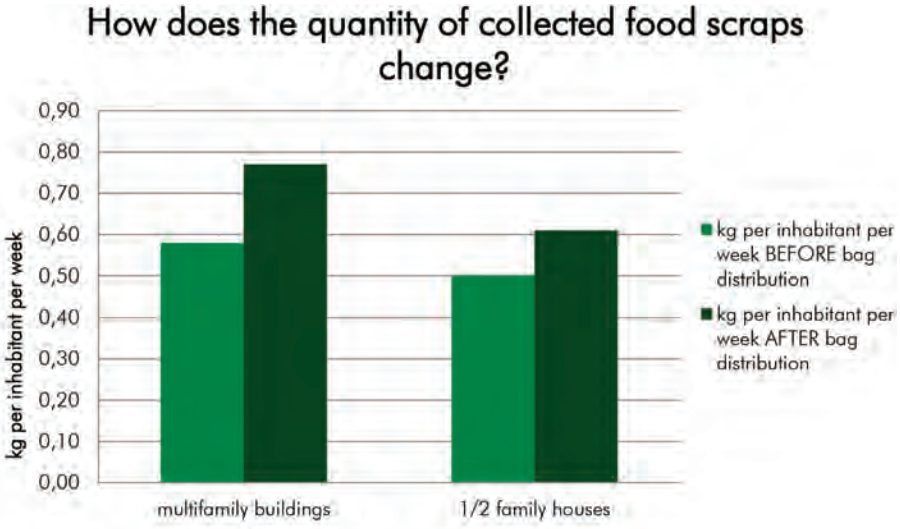

Fig. 2: Increase in the share of household organic matter in biowaste bins before and during use of biowaste bags [4].

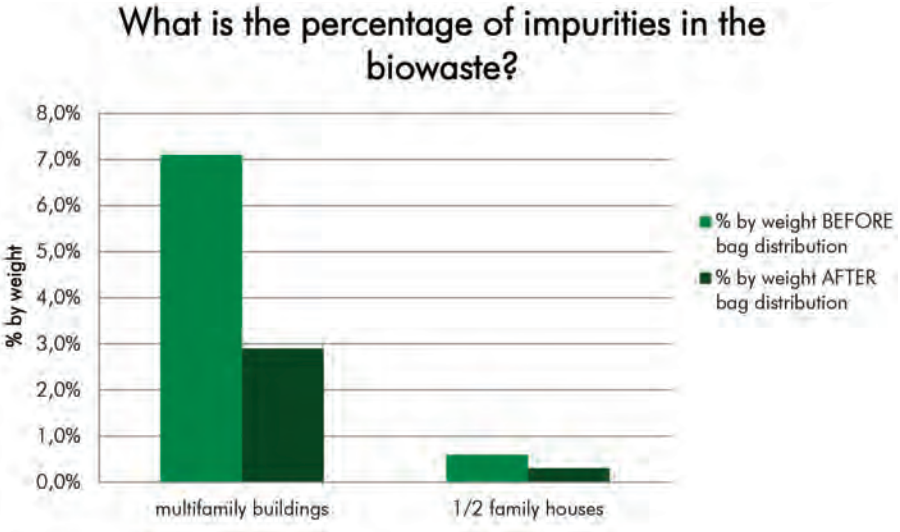

Fig. 3: Decrease of impurities in biowaste bins before and during use of biowaste bags (result of 2 sorts during the test phase) [4].

Sources

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