Open-Bio

Opening bio-based markets via standards, labelling and procurement

Work package 6
Managed end-of-life options

Deliverable N° 6.5:

Validated standard for decentralized composting

Public summary

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prepared by:

Organic Waste Systems nv (OWS nv) and Novamont
B. De Wilde & N. Mortier (OWS nv) and M. Tosin & M. Pognani (Novamont)

OWS nv
Dok Noord 5
B-9000 Gent
Belgium
Tel.: +32 (0)9 233 02 04
Fax: +32 (0)9 233 28 25
Email: bruno.dewilde@ows.be / nike.mortier@ows.be / maurizio.tosin@novamont.com
Partner website: www.ows.be / http://www.novamont.com/
Project website: www.open-bio.eu

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List of abbreviations, acronyms and used standards

AS 5810	*Biodegradable plastics – Biodegradable plastics suitable for home composting* (2010)
EC	Electrical Conductivity
ISO 17088	Specifications for compostable plastics
ISO 18606	Packaging and the environment - Organic recycling
NF T51-800	*Plastics - Specifications for plastics suitable for home composting* (2015)
SPCR 141	Appendix 2 *Polymeric waste compostable in small scale (home) com-posts – Requirements and test methods*
TS	Total Solids
UNI 11355	*Plastic items biodegradable in home composting – Re-quirements and test methods* (2010)
VGF	Vegetable, Garden and Fruit waste
VS	Volatile Solids

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1 Public summary

Work Package 6 of Open-Bio investigates the suitability of several managed end-of-life options for bio-based products: industrial and home composting, anaerobic digestion, mechanical recycling and chemical recycling. The objective of task 6.2 “Validation of decentralized compostability test standards” of the Open-Bio project is the development of a test scheme to evaluate if bio-based products can be disposed in a home composting system without having a negative impact on the produced compost. This implies that no visual contaminants, toxic residuals and/or not-biodegradable constituents may remain present in the compost. This work is a follow-up of work carried out earlier in the project (Deliverable 6.3 “Review on decentralized composting” and Deliverable 6.4 “Draft standard on decentralized composting”).

Home composting is a way to convert vegetable, garden and fruit waste (VGF) to compost in small scale installations that are generally located in the backyard. The obtained compost is then used as a nutrient source to the garden soil. Besides the addition of nutrients, the addition of compost is also beneficial for the soil structure (e.g. higher water holding capacity, increase of organic matter, etc.). Several types of home composting systems exist with varying dimensions (vermicomposting systems, plastic composting bins, large holding units, rotating composters, composting heaps, etc.). Home composting may not be confused with industrial composting. In home composting systems the volumes composted are much smaller when compared to industrial composting. Moreover, in industrial composting systems, compost is frequently turned or actively aerated, while in home composting installations, the compost is only turned a few times or aerated only once a week with an aeration stick. This implies that the temperature in industrial composting installations is much higher when compared to home composting installations and the duration of an industrial composting process is consequently much shorter when compared to a home composting system. As different types of home composting systems exist, home composting is a process that is more difficult to standardize when compared to industrial composting. Moreover, if home composting is not properly performed, it could lead to different problems (waste not transformed in compost, smell, insects and if present only partial or poor degradation of home compostable biodegradable materials). It is important that home composting is performed with care and under well managed conditions in order to avoid such problems.

In general, it can be stated that **home composting can be a suitable and interesting managed end-of-life option for certain types of bio-based products**. Products like coffee filters and teabags are often added to home composting systems and therefore it would be good if such products fulfil minimum requirements for home compostable products. A large part of the coffee filters and teabags which are on the market are made of paper and will consequently not influence the home composting process negatively, but the last years it is noticed that also the market of teabags made of convention plastics and plastic coffee capsules significantly growing. This can lead to confusion in the market and due to this confusion it is also possible that conventional not biodegradable products end up in the environment.

Moreover, it would also be beneficial if products which often end up not intentionally in home composting systems (like fruit labels) would be home compostable. Other possible applications for which home compostability would be beneficial could be products which cannot easily be mechanically recycled (e.g. laminated films, coated cups, etc.). In order to stimulate the disposal of such bio-based products in home composting systems, the producer of bio-based products should be able to inform consumers correctly about the behaviour of their products under home composting conditions. Therefore, **a European standard specification is needed which prescribes requirements for products that can be labelled as home compostable**. Such European standard specification is currently not existing.

As described in detail in Deliverable 6.3 "Review on decentralized composting" already some national standard specifications (e.g. NF T51-800 *Plastics - Specifications for plastics suitable for home composting* (2015), AS 5810 *Biodegradable plastics – Biodegradable plastics suitable for home composting* (2010), Appendix 2 of SPCR 141 *Polymeric waste compostable in small scale (home) composts – Requirements and test methods* and UNI 11355 *Plastic items biodegradable in home composting – Requirements and test methods* (2010)) and labelling systems (e.g. OK compost HOME of Vinçotte, HOME COMPOSTABLE Din Geprüft, etc.) exist at this moment for home compostable products. The principles of these standard specifications are comparable. They all require that chemical characteristics (heavy metals, fluorine and volatile solids content), biodegradation, disintegration and environmental safety are evaluated. However, when looking more in detail, there also exist some small differences between the standard specifications (e.g. evaluation of toxicity towards earthworms is only required by AS 5810, the temperature profile of Annex 2 of SPCR 141 is significantly different from the other specifications, etc.). This might lead to some confusion in the market and therefore it would be preferable if the requirements are harmonized on international or European level.

A standard specification with criteria for products suitable for home composting was developed in the Open-Bio project based on the principles of the existing documents. This document can be used as starting point for the development of a European standard specification in a relevant CEN group (e.g. CEN/TC 249 "Plastics", CEN/TC 261 "Packaging", CEN/TC 411 "Bio-based products", CEN/TC 444 "Environmental claims", etc.). The developed specification describes requirements related to:

- material characteristics
    - volatile solids
    - heavy metals and fluorine content
    - use of substances of very high concern is forbidden
- biodegradation at ambient temperature
    - minimum 90% absolute or relative biodegradation after 1 year
- disintegration at ambient temperature
    - minimum 90% disintegration after 6 months
- environmental safety
    - no negative effects on germination and growth of plants

Moreover, **the laboratory disintegration test methodology was also evaluated by means of a real life validation test**. Several materials were evaluated (OK compost HOME certified bread bag, OK compost HOME certified rice packaging, OK compost HOME certified magazine packaging, PBSeT and 4 different types of bags used as packaging for vegetables and fruits) in the laboratory and in a field test.

In the laboratory test 2 parameters were investigated: (1) the addition method and (2) the inoculum source. The test items were added in three different ways to the inoculum: (1) as such or cut into large pieces, (2) cut into 2.5 × 2.5 cm pieces (as prescribed by ISO 20200) and (3) in slide frames (as allowed by the OK compost HOME certification scheme). Two different inocula sources were compared: (1) 80% mature compost + 20% vegetable and fruit waste and (2) the UNI 11355 inoculum (= mature compost + starch + rabbit food).

The field test was performed by Novamont, 8 VLACO composting instructors, 2 OWS employees and 5 Vinçotte employees. Several types of home composting systems were used for the validation test (vermicomposting systems, rotatory composters, plastic composting bins, holding units and composting heaps). The temperature was also measured in a few systems.

From the laboratory test, it can be concluded that the UNI 11355 inoculum seems to be more active when compared to the mixture of 80% mature compost and 20% vegetable and fruit waste. As the UNI 11355 inoculum is more standardized, it is recommended to use this inoculum for the evaluation of the disintegration. Moreover, when comparing the different addition methods, it can be stated that the method by means of slide frames is somewhat faster when compared to the method by means of 2.5 × 2.5 cm pieces, while the method by means of 2.5 × 2.5 cm pieces is somewhat faster when compared to adding the test material as such or cut into large test item pieces. Adding the test item in rather large pieces or as such shows the behaviour/disintegration of the test material most in detail (e.g. it can easily be distinguished which parts of the product disintegrate slower), but the disadvantage of this procedure is that the duration of the test could become longer.

From the temperature measurements during the field test, it can be concluded that the temperature significantly varies between the different home composting systems. In a vermicomposting system (= the smallest home composting system), no temperature increase was detected (± 15°C during the entire period). In a plastic composting bin and in a rotary composter, the temperature is somewhat higher than ambient temperature, but the difference is not very large (around 5°C-6°C). In larger composting systems (holding units or composting heaps), in which normally large volumes of garden waste are composted, the temperature can become significantly higher. Temperatures up to approximately 65°C were measured in such systems.

From the comparison between the laboratory tests and the field tests, it can be concluded that materials that were characterised by sufficient disintegration in the laboratory tests (OK compost HOME certified bread bag, OK compost HOME certified rice packaging, PBSeT and

the bags used as packaging for vegetables and fruits) were in the majority of the field tests also characterised by sufficient disintegration. In the laboratory, the OK compost HOME labelled magazine packaging disintegrated very slowly (in fact even too slowly in order to obtain the OK compost HOME certificate). This material was also retrieved in the field tests when the compost was harvested. In general, it can be concluded that the relationship between the laboratory scale test and the field scale test is good in spite of the fact that the laboratory test is performed under optimal and constant conditions.

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