Interlaboratory comparison test on soil improver quality

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Introduction and objectives

The recycling of nutrients and organic material helps create a closed nutrient cycle and reduces the need for additional nutrients from non-renewable sources. To increase the market potential for bio-based fertilizer products it is necessary to improve and monitor their quality. Soil improver quality is commonly determined using a test battery of chemical and biological analysis.

Materials and methods

An interlaboratory comparison test was organized to determine the composition, phytotoxicity, stability and maturity of two green waste and sewage sludge soil improver samples (Figure 1). The performed analyses were:

- Germination and root growth of cress
- Nitrate-N/-ammonia-N ratio
- Self-heating
- CO2-production

In addition, chemical parameters (dry weight, pH, electrical conductivity, bulk density and organic matter content) were measured (Table 1 and Figure 2). In total 11 participants took part, of which eight were from Finland. The interlaboratory comparison test was carried out in accordance with international guidelines.

Results and discussions

The performance of the participants was evaluated by using z scores. Altogether 50% of the participants used accredited analytical methods for at least some of the measurands and 100% of their results were satisfactory. In this proficiency test, 96% of the results were satisfactory when deviation of 1 pH units and 25–80% (for other determinations) from the assigned value were accepted. Maturity assessment of these samples, according to criteria from Finnish legislation and results from laboratories that performed at least three of these maturity tests, showed that both samples were mature and stable (Table 2).

Table 1. Measurands reported by participant laboratories.

Measurand/analysis	Standard
Average germination ratio (petri dish test using cress,)	EN 16086-2
Bulk density	EN 13040
CO_2-production/bottle (closed bottle test)	Itävaara et. al 2006
CO_2-production rate (closed bottle test)	Itävaara et. al 2006
Electrical conductivity	EN 13038
Dry matter content	EN 13040
N-NH_4	EN 13652, annex B
N-NO_3	EN 13652, annex B
N-NO_3/N-NH_4 –ratio	Itävaara et. al 2006
Organic matter content	EN 13039
pH	EN 13037
Plant root index (petri dish test using cress,	EN 16086-2
Plant root length (petri dish test using cress, EN 16086-2)	EN 16086-2
Self-heating test, Rottegrad test	EN 16087-2

Table 2. Maturity assessment of analyzed samples based on mean values of participants' (n=6) results.

Sample	CO_2-production (<3 mg CO_2-C/gVS/d)*	MLV (> 80%)*	Self-heating (20-40oC)**	NO_3-N/NH_4-N (>1)**
S1	YES	YES (71%)		
	YES	YES (83%)		
S2	YES	YES (29%)	YES	YES

*according to [3]
**according to [1]

Figure 1. From left to right: 1) Field sampling from sewage sludge soil improver pile, 2) sieving sample through 20 mm mesh sieve, 3) homogenizing and dispensing samples into plastic bags / Photos: Liisa Maunuksela, Finnish Food Authority

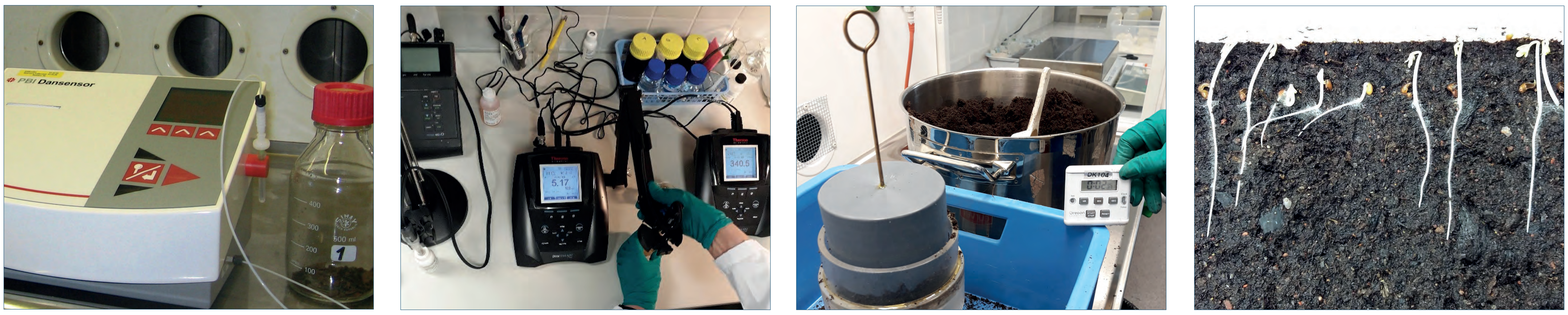

Figure 2. Laboratory analysis of soil improver samples. From left to right: 1) Closed bottle test for measuring sample CO_2-production, 2) sample pH and EC measurement, 3) determining sample bulk density and 4) plant root length and index / Photos: Leena Kaarla, Päivi Mäki ja Salla Pelkonen, Finnish Food Authority

Conclusions

According to our results many participants had good practices and manage these analyses well. However, more detailed guidance on procedures that may affect the results is still needed. Further harmonization is recommended e.g. by training courses and updating existing method description in order to standardize procedures.

References

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