Supplementary information

S1 Quantification of remaining DCM

20 g of seeds were triple-coated consecutively with pure PLA (5% in DCM) according to the description in section 2.1. and left on an aluminium foil until the solvent evaporated. In order to investigate the development of the DCM remains in the coated seeds, samples were collected after 2 min, 5 min, 10 min, 30 min, 1 h, 2 h, 5 h and one day of solvent evaporation. Each time 2 g of seeds were placed in 10 g of toluene (Fluka, 99.7%) and shaken therein for 30 min. Two times 2 mL were taken from each sample, which were filtered and stored at 4°C until GC-analysis with GC-MS (mass spectroscopy) and GC-FID (flame ionisation detector) (Agilent GD 6890) was carried out.

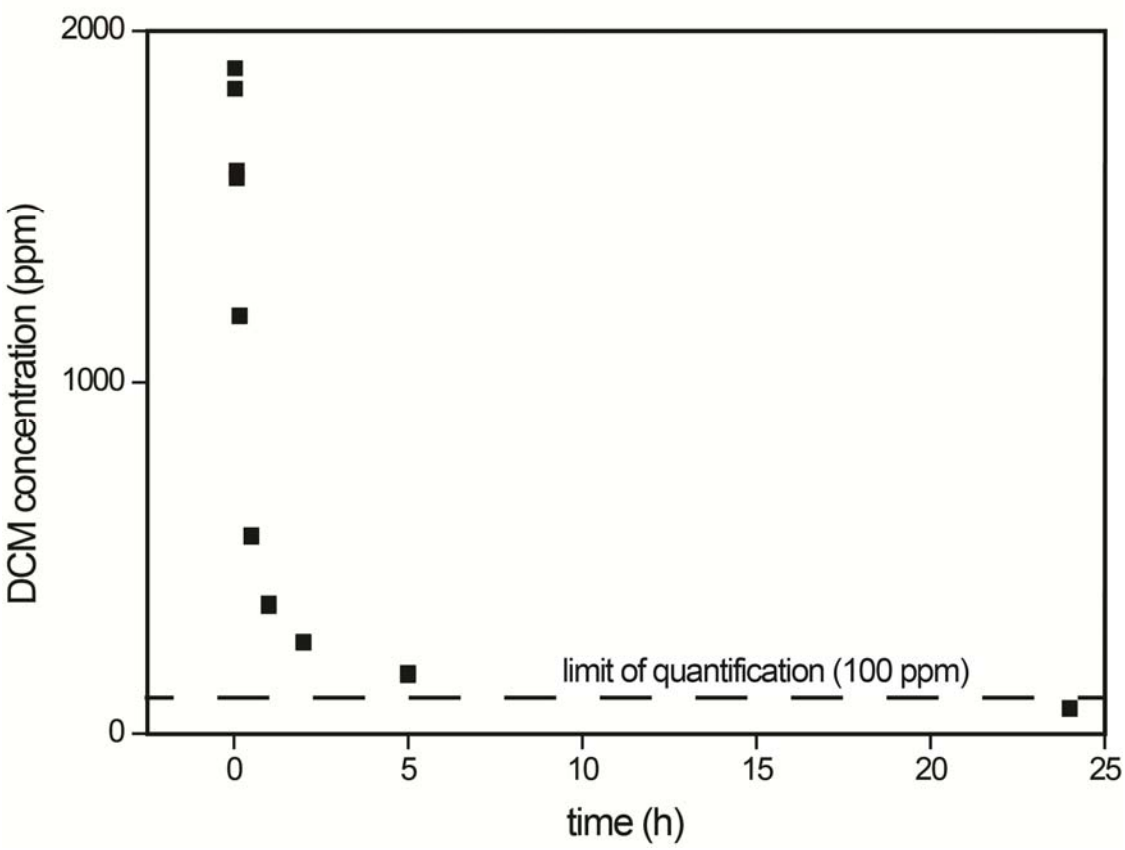

Fig S1 DCM remaining in the seed coating was followed by gas chromatography. Three subsequent layers of pure PLA (5% in DCM) were coated on the seeds. Seeds were sampled at different times during the solvent evaporation process.

As soon as 24 h after the coating process the limit of quantification was reached. This means that 10 mL of toluene incorporating 2 g of seeds (~44 grains) contained less than 100 ppm of DCM (equivalent to ~20 µg DCM/ seed). Calculation revealed that when sowing 400 seeds per square meter less than 9 mg DCM would thereby be released to the soil. This value seems low although no threshold values for DCM in soil could be found. Compared to the maximally allowed concentration at a working space (360 mg m^{-3} in Switzerland), the value is extremely low. Additionally it should be noted that different microorganisms present in soil are able to degrade DCM[1].

S2 Cost analysis

Table S2 Cost analysis of coated seeds in comparison to the cost of uncoated seeds.

material	lab-scale price	large-scale price	mass needed to coat 1 kg of seed	cost per kg seed (large-scale)
PLA	200 $‡ / 10 g [a]	1.1 – 2.2 $ / kg [b]	44 g	0.048 - 0.097 $
MN	51.7 $‡ / 50 g [c]	20 - 100 $ / kg [d]	1.47 g	0.029 - 0.147 $
HNL	103 $‡ / KU [c]	1000 $ - 20000 $ / kg [e]	40 mg [f]	0.04 $ - 0.8 $
			total coating	**0.117 - 1.04 $**

Pure wheat seeds have a cost of ~1100 $‡ per ton [g]. This corresponds to 1.1 $ kg^{-1}. Coated seeds would, therefore, cost 1.22 - 2.10 $ kg^{-1} which is 11-91% more expensive than the uncoated seeds.

‡calculated from € or CHF (1 € = 1.38 $; 1 CHF = 1.11 $)

[a]Polysciences, Inc. (http://www.polysciences.com/Catalog/Department/Product/98/categoryid--551/productid--1002/, 24.09.2013)

[b]Present price and forecast predicted by K.M. Nampoothiri *et al.*[2]

[c]Sigma-Aldrich (http://www.sigmaaldrich.com/catalog/product/sigma/79847?lang=de&region=CH, 24.09.2013)

[d]Estimation (0.02 to 0.1 times the lab scale price)

[e]Estimation of M.C.M. Hensing *et al.*[3]

[f]Activation was estimated to be 40 Units/mg (Brenda-Enzymes, EC 4.1.2.10)

[g]Bioland Markt GmbH & Co. KG, catalog from august 2013

S3 Mass gain upon seed coating

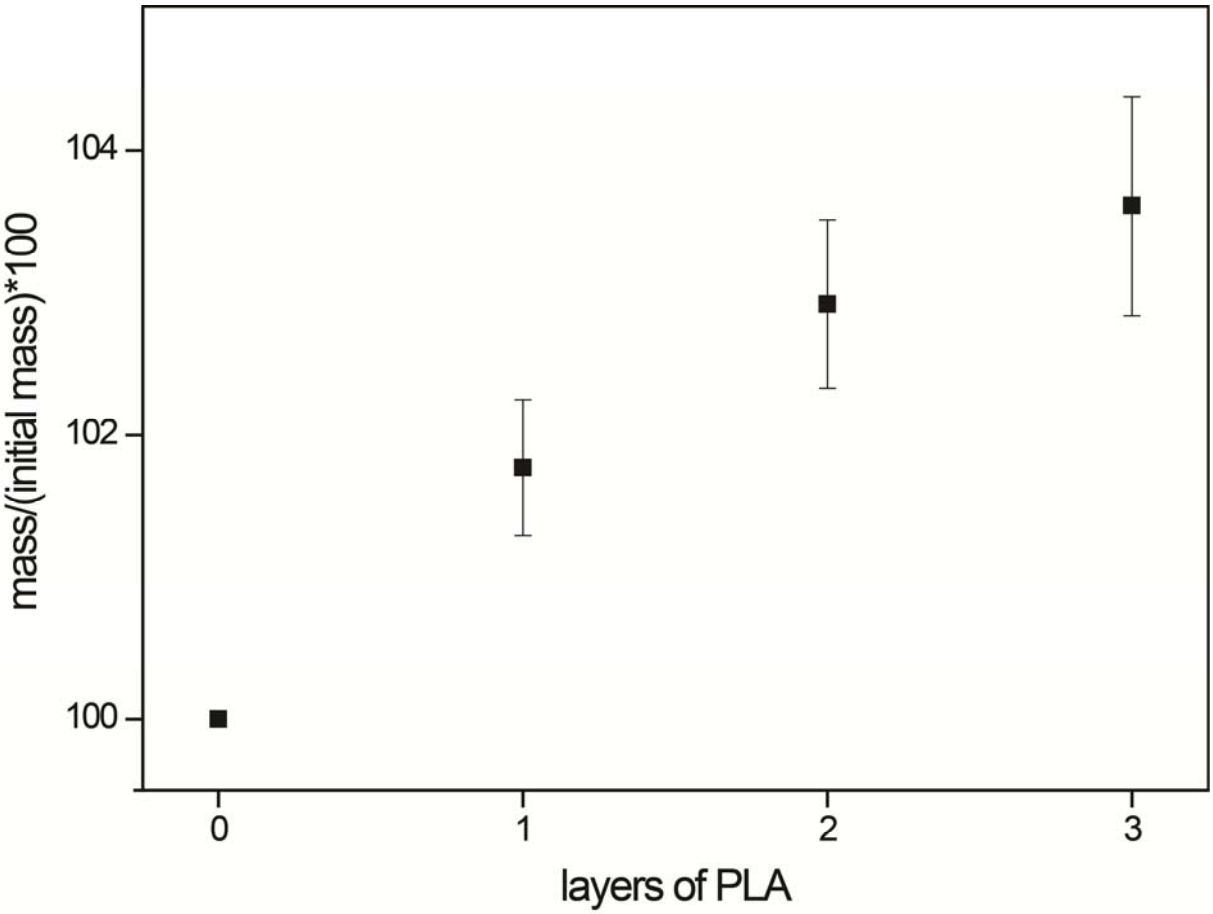

Fig S3 Mass evolution throughout seed coating steps. Following the addition of PLA layers the relative mass of the seeds increased. Seeds (4 g) were coated in three consecutive coating steps. The experiment was carried out in triplicate (n = 3). The mass gain per coating step slightly decreased by every consecutive step. This is probably caused by dissolution of some of the previous PLA layer in the subsequent coating solution.

S4 Coated and uncoated seeds analysed by scanning electron microscopy

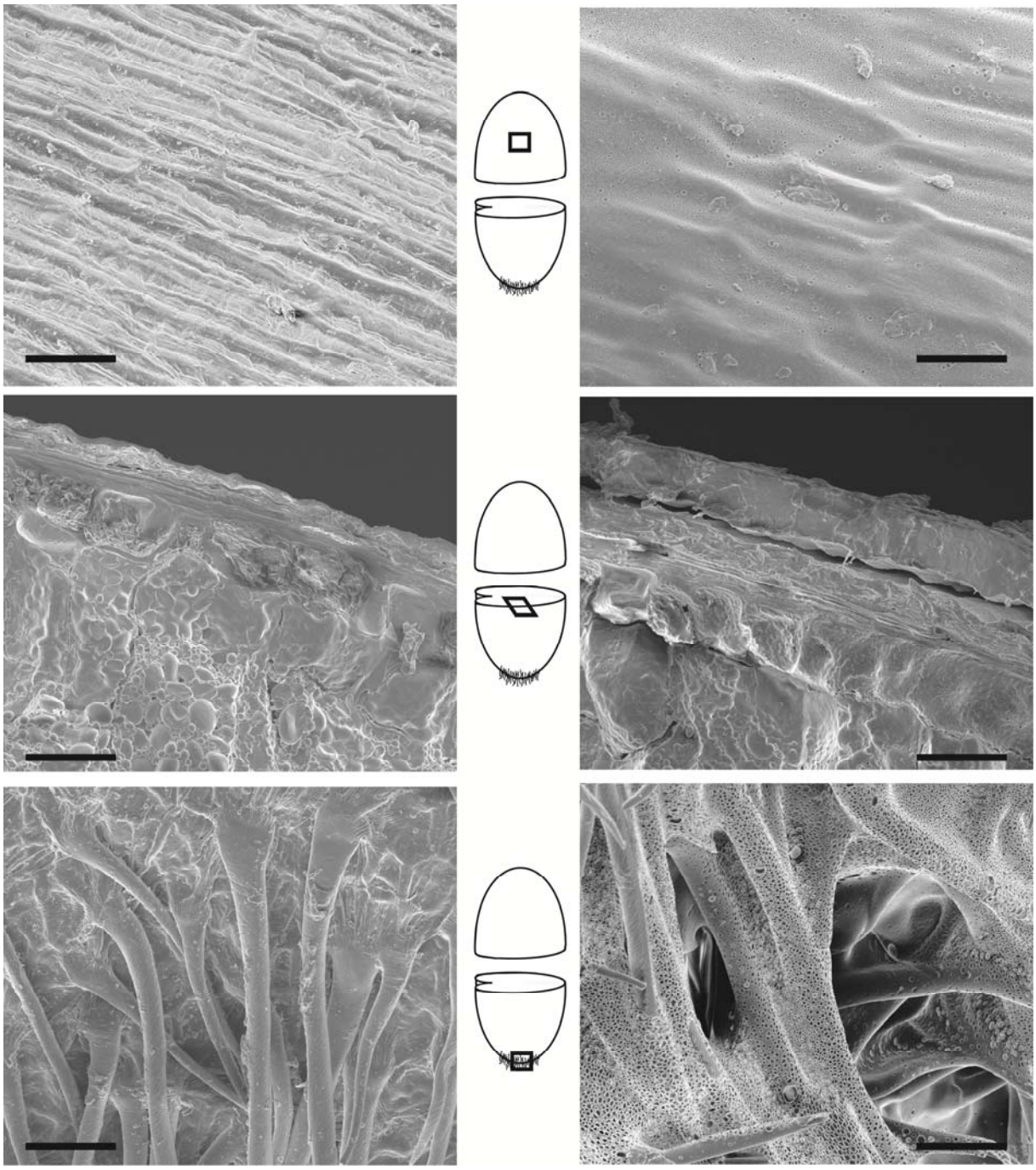

Fig S4 Scanning electron micrographs of untreated (left) and coated seeds (right). The coated seeds were prepared according to the "inner layer" model and contained mandelonitrile and hydroxynitrile lyase. Different parts of the seeds are shown as indicated in the sketches in the centre of the figure. The scale bar corresponds to 50 µm.

S5 Literature

1. V. I. Krausova, F. T. Robb and J. M. Gonzalez, *Hydrobiologia*, 2006, **559**, 77-83.
2. K. M. Nampoothiri, N. R. Nair and R. P. John, *Bioresource Technol.*, 2010, **101**, 8493-8501.
3. M. C. M. Hensing, R. J. Rouwenhorst, J. J. Heijnen, J. P. Vandijken and J. T. Pronk, *Anton. Leeuw. Int. J. G.*, 1995, **67**, 261-279.