Supplementary Material to:

A biobased, bioactive, low CO_2 impact coating for soil improvers.

Authors:

Renate Weiß[1], Sebastian Gritsch[1], Günter Brader[2], Branislav Nikolic[2], Marc Spiller[3], Julia Santolin[3], Hedda Weber[4], Nikolaus Schwaiger[4], Sylvain Pluchon[5], Kristin Dietel[6], Georg Gübitz[1,7], Gibson Nyanhongo[1,7]

[1]University of Natural Resources and Life Sciences, Vienna, Institute of Environmental Biotechnology, Konrad Lorenz Straße 20, 3430, Tulln an der Donau, Austria

[2]AIT, Austrian Institute of Technology, Konrad-Lorenz-Straße 24, 3430 Tulln, Austria

[3]University of Antwerp, Department of Bioscience Engineering, Research Group of Sustainable Energy, Air and Water Technology, Groenenborgerlaan 171, 2020 Antwerpen, Belgium

[4]SAPPI Papier Holding GmbH, Brucker Strasse 21, 8101 Gratkorn, Austria

[5]Centre Mondial de l'Innovation Roullier - Laboratoire de Nutrition Végétale, 18 avenue Franklin Roosevelt, 35400 Saint-Malo, France

[6]ABiTEP GmbH, Glienicker Weg 185, 12489 Berlin, Germany

[7]Austrian Centre for Industrial Biotechnology (ACIB), Konrad Lorenz Strasse 20, 3430, Tulln an der Donau, Austria

Specifications of magnesium lignosulfonates provided by SAPPI

Appearance: Brown liquid
Solid Content: 8%
Ash content: 4,4% of dry basis
Reducing Sugars: Below 1000mg/kg liquid
Rest are lignosulfonates
pH:3-4
Full Water soluble
Mg and Ca content was not analysed

Effects of polymerized lignosulfonates on plant germination and growth

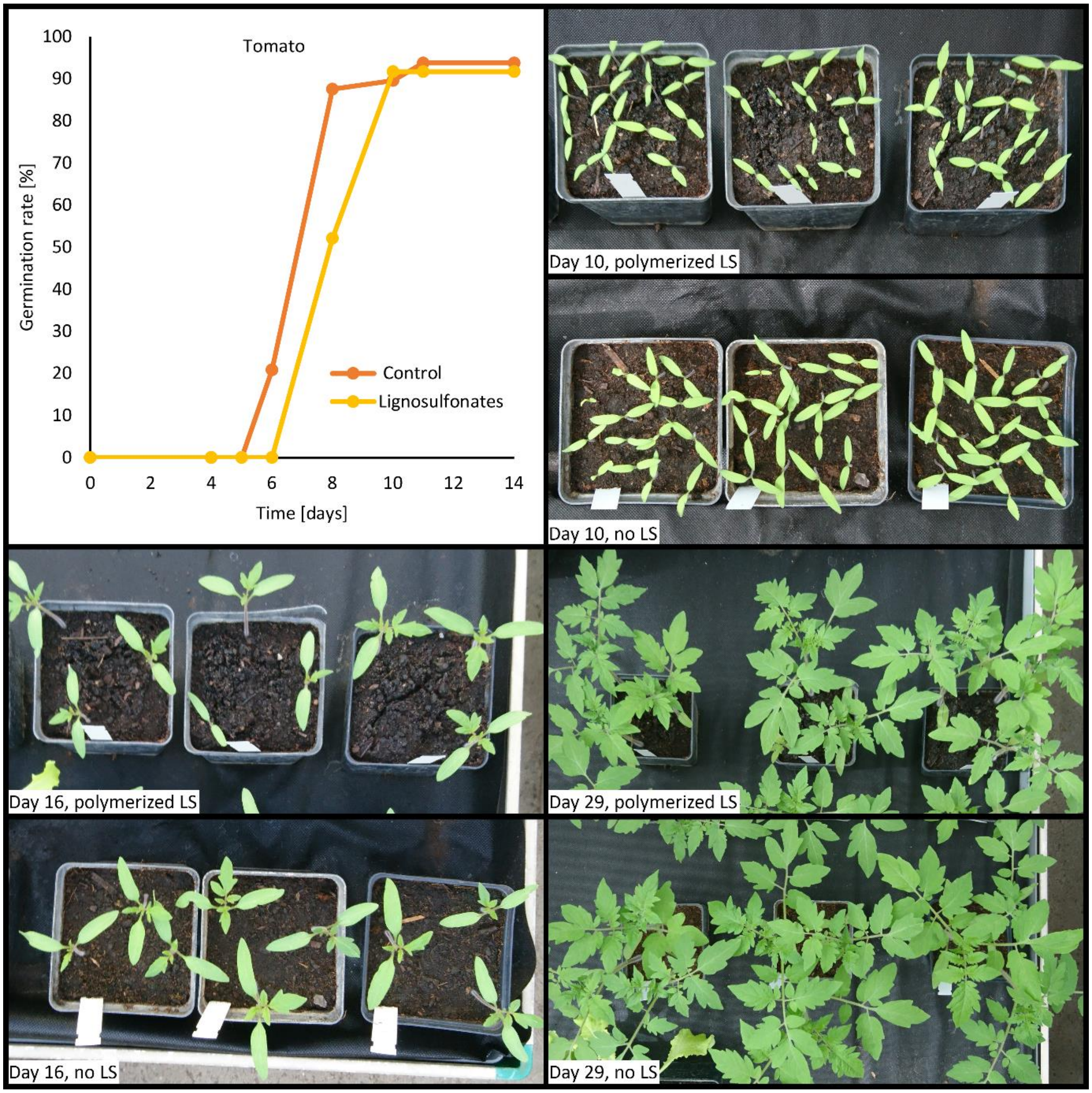

Figure 10: Comparison of germination rate and growth development of tomato on fertile soil and fertile soil with 3.6 % v/v polymerized lignosulfonates added.

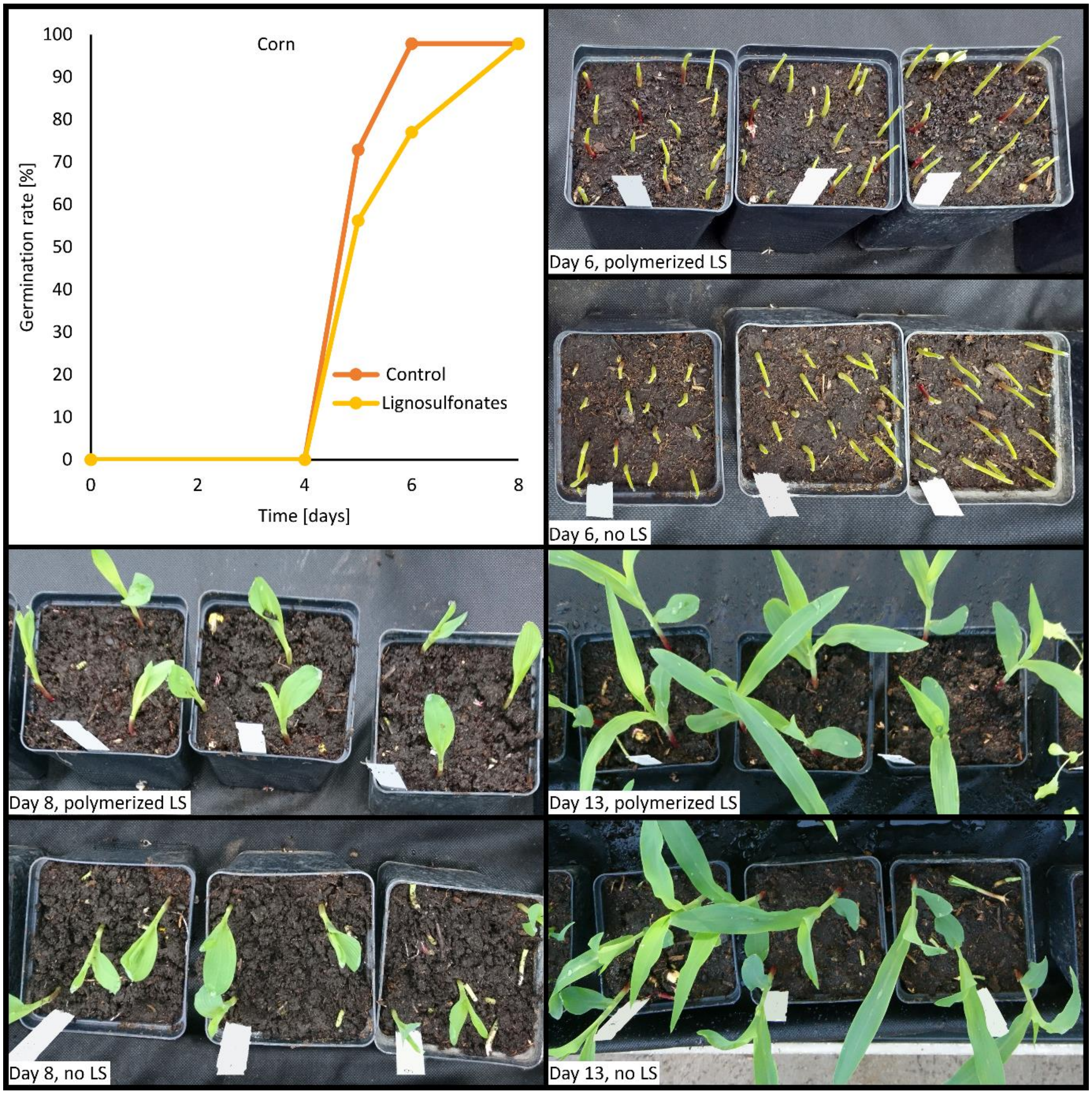

Figure 11: Comparison of germination rate and growth development of corn on fertile soil and fertile soil with 3.6 % v/v polymerized lignosulfonates added.

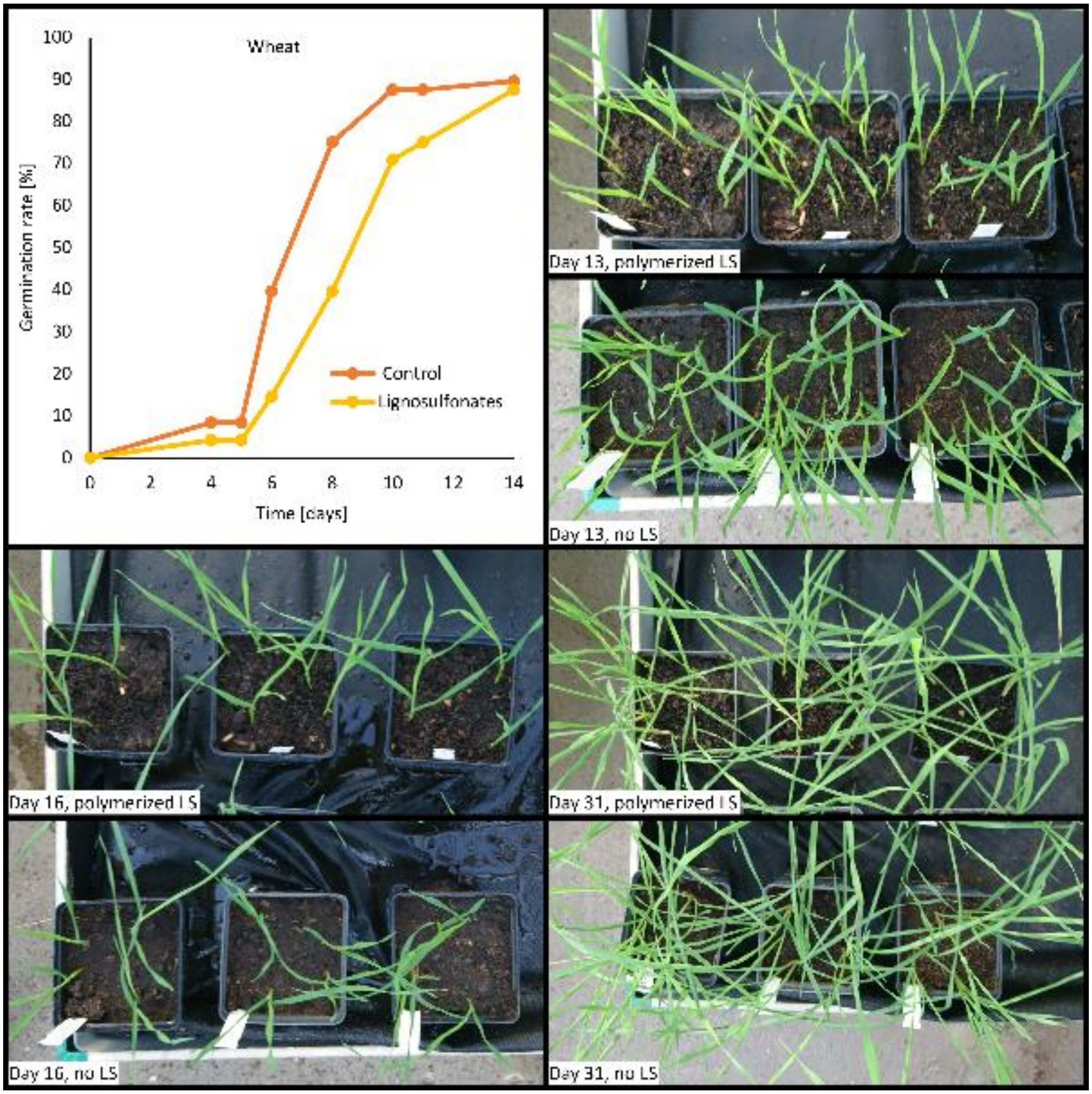

Figure 12: Comparison of germination rate and growth development of wheat on fertile soil and fertile soil with 3.6 % v/v polymerized lignosulfonates added.

Life cycle inventory

Table 1 shows the processes and their emissions used for modelling CO_2-eq. emissions. Table 2 indicates the amounts of products used to produce 1 kg of LS. Min and max value show the expected efficiencies that can be realized at an industrial scale in an optimized (min) and a not fully optimized (max) scenario.

Table 1: Life cycle processes used

EcoInvent 3.4 process or reference	Motivation for selection and reference	Value GWP100a	Unit
Heat, in chemical industry {RER}| steam production in chemical industry | Conseq, U	Proxy for marginal heat demand	0.27	kg CO_2-eq./ kWh heat
Electricity, low voltage | market for | Conseq, U		1.12	kg CO_2-eq./ kWh el
Polyurethane, flexible foam | market for | Conseq, S	Proxy for current state-of-the-art coating (Azeem et al. 2014)	5.12	kg CO_2-eq./kg
Polyethylene, linear low density, granulate | market for | Conseq, U	Proxy for current state-of-the-art coating	1.92	kg CO_2-eq./kg
Xylitol	Plasticizer (Dasgupta et al. 2021)	17.29	kg CO_2-eq./kg
Glycerine | market for | Conseq, U	Plasticizer	2.26	kgCO_2 eq/kg
Maize starch | production | Conseq, U	Plasticizer	0.721	kgCO_2 eq/kg

Table 2: Inventory of processes used for production of 1kg of LS coatings.

	min	max	Unit
Heat, in chemical industry {RER}| steam production in chemical industry | Conseq, U	1.27	9.11	kWh
Electricity, low voltage {AU}| market for | Conseq, U - purification	0.19	0.30	kWh
Electricity, low voltage {AU}| market for | Conseq, U – polymerization [value max value current aeration energy demand in paper with a fine bubble aeration efficiency of 15.64 m^3 air /kWh, min scenario assumes 20% efficiency gain to full scale)	0.3	0.38	kWh
Xylitol, Glycerine	0.33	0.33	kg
Lignosulfonate	0.66	0.66	kg

References

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Dasgupta, D., Sidana, A., Ghosh, P., Sharma, T., Singh, J., Prabhune, A., More, S., Bhaskar, T. and Ghosh, D. (2021) Energy and Life Cycle Impact Assessment for Xylitol Production from Corncob. *Journal of Cleaner Production* 278, 123217. 10.1016/j.jclepro.2020.123217