



General information	
PPP-number	TKI-AF-16165
Title	Biobased, biodegradable and sprayable cover material for horti- and agriculture
Theme	Advanced Products, Biobased Economy/ "Bioraffinage voor de Circulaire Economie – Koepel PPS" (AF 16083)
Implementing institute	Wageningen Food & Biobased Research (WFBR; coordinator) Wageningen Plant Research (WPR)
Project leader research (name + e-mail address)	Originally: Hans MooiBroek; as of mid 2018: Frits de Wolf; frits.dewolf@wur.nl
Coordinator (on behalf of private partners)	Nitto Denko Corporation, 1-1-2, Shimohozumi, Ibaraki, Osaka 567-8680, Japan, represented by its Director, Deputy CTO Mr. Hironori MOTOMURA
Project-website address	n.a. / https://www.wur.nl/nl/Onderzoek-Resultaten/Onderzoeksprojecten-LNV/Expertisegebieden/kennisonline/Biobased-biodegradable-and-spray-able-cover-material-for-horti-and-agriculture-1.htm
Start date	01-02-2017
Final date	31-02-2019

Approval by the coordinator of the consortium	
The final report must be discussed with the coordinator of the consortium. The "TKI's" appreciate additional comments concerning the final report.	
Assessment of the report by the coordinator on behalf of the consortium:	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Not approved
Additional comments concerning the final report:	n.a.

Consortium	
Mention any changes in the composition of the project partners:	<ul style="list-style-type: none"> The facilities at Nitto Denko Europe Technical Centre Sàrl, EPFL Innovation Park, Bâtiment G, Sud, CH-1015 Lausanne, have been closed. Under coordination by Tetsuo Inoue of Nitto Denko Japan, the project activities are being taken over by Nitto Belgium NV, having its office at Eikelaarstraat 22, 3600 Genk, Belgium, Director Kenichi Shibata. Dutch nurseries and Swiss farmers could not be engaged

Summary of the project	
Problem definition	The current increase in food demand combined with the decrease of arable land puts pressure on agriculture to improve production yields. Agriculture films and more particularly mulching films serve this purpose since they allow weed suppression, reduce moisture loss from the soil, increase soil temperature and provide protection against

	erosion. These combined advantages lead to a reduced necessity of chemical weed control, a reduction of water consumption as well as faster crop development, thus answering societal and farmer needs. The major drawback, however, of most current commercial agriculture films are the problems associated with their disposal. Non-degradable polymers (such as the commonly used polyethylene), tend to accumulate as plastic waste, creating a serious problem of plastic waste management. Therefore concerns about pollution associated with the use of non-renewable and non-degradable materials combined with changing regulation, call for green material alternatives in the field of agricultural films.
Project goals	Biobased and biodegradable mulching films are already known and commercially available. However, both their performances, which are still to be improved, and their too high price are hampering their adoption. The project's objective was to develop a sprayable mulch formulation to be used for weed control and acceleration of plant growth. This liquid formulation should be able to form a polymer network that is impenetrable for weeds but permeable for moisture and is biodegradable with time in/on soil following EU standards currently under development.

Results	
Planned results in the original project plan	Methods to formulate a sprayable biopolymer dispersion composed of lignin and PHA, which should form films upon drying, which film should have the following properties: <ul style="list-style-type: none"> • sufficient water resistance, • sufficient mechanical strength, so as to prevent perforation by weeds • full biodegradability <i>in-situ</i> (i.e. on the land) within a reasonable time window (e.g. several months) • a sufficiently low cost price of production
Achieved results	<ul style="list-style-type: none"> • methods to formulate sprayable dispersions with film-forming properties • as yet insufficient water resistance and strength of film formulations
Explanation of changes relative to the project plan	Within the time span and budget of the project, it turned out to be hard to realize formulations forming films with all required properties. Significantly more research is needed. One of the industrial partners started an effort to still realize an acceptable formulation.

What was the added value created by the project for:	
Participating "Knowledge Institutes" (scientific, new technologies, collaboration)	Insight into the possibilities for formulating sprayable, film-forming biopolymer dispersion
Participating private partners (practical application of the results, within which period of time?)	Insight into the possibility of using lignin for the formulations of the intended films (Metsä); insight into the possibilities for the realization of lignin-containing film-forming sprayable dispersions (Nitto); outlook to practical applications, may-be based on partially chemosynthetic polymer mixtures.
Society (social, environment, economy)	Although, within the time-span & budget of the project, sprayable film formations complying with the original criteria were not yet realized, the project provided an outlook towards future development of such formulations, which will then have a beneficial environmental impact.

Possibly other stakeholders (spin-offs)	n.a.
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Follow-up	
Did the PPP result in one or more patents (first filings)?	no
Are there any follow-up projects planned? If yes, explain. (Contract research resulting from this project, additional funding, or new PPP projects)	no

Deliverables/products during the entire course of the PPP (provide the titles and/or a brief description of the products/deliverables or a link to a website.)
<u>Scientific articles:</u> no
<u>External reports:</u> (For the the project partners only confidential: 'Sprayable mulching films' (March 2019) Wageningen Food & Biobased Report 1920)
<u>Articles in professional journals/magazines:</u> no
<u>(Poster) presentations at workshops, seminars or symposia.</u> no
<u>TV/ radio / social media / newspaper:</u> no
<u>Remaining deliverables (techniques, devices, methods, etc.):</u> Various methods to formulate and / or modify lignins, polyhydroxyalkanoates and other polymers used in the project, and their combinations. https://www.wur.nl/nl/Onderzoek-Resultaten/Onderzoeksprojecten-LNV/Expertisegebieden/kennisonline/Biobased-biodegradable-and-spray-able-cover-material-for-horti-and-agriculture-1.htm

