

COLLABORATION PROPOSAL

MENDEL UNIVERSITY IN BRNO/ BIOtransfer

IN PLANTA BIOLOGICAL EFFICIENCY OF A GRAPHENE-CU-ZN COUPLE TOWARDS *PLASMOPARA VITICOLA*

BIOtransfer reference: P/MEN/CZ/22/01

Parties:

Mendel University in Brno, public university
Zemědělská 1665/1
613 00 Brno, the Czech Republic
Represented by prof. Dr. Ing. Jan Mareš. – Rector of Mendel University
ID: 62156489
VAT ID: CZ62156489

(Hereinafter referred to as “MENDEL UNIVERSITY”)

And

BIOtransfer SARL
41 Rue Emile Zola
93100 Montreuil, the French Republic
Represented by xxxxxxxxxxxxxxxx
ID: BOBIGNY RCS B 348 786 559
VAT ID: FR 28 348 786 559
IBAN account number: xxxxxxxxxxxxxxxxxxxxxx

(Hereinafter referred to as “BIOtransfer”)

I. GENERAL BACKGROUND

1. MENDEL UNIVERSITY and BIOtransfer have already collaborated in the past to establish the fungicide activity of a graphene-based nanocomposite product towards Apple Scab (*Venturia inaequalis*) and Late Blight (*Phytophthora infestans*) during *in vitro* evaluations. MENDEL UNIVERSITY has now at its disposal new batches of nanocomposite product composed of reduced Graphene Oxide, Copper and Zinc (rGO-Cu-Zn) and is willing to investigate *in planta* its fungicide efficacy towards *Plasmopara viticola*, the causal agent of Downy Mildew on grape vine.

2. This contract ensures that BIOtransfer will assess the fungicidal activity of rGO-Cu-Zn in a preventive application. rGO-Cu and rGO-Zn will also be evaluated to address the contribution of each part to the overall fungicidal efficacy.

3. MENDEL UNIVERSITY will send the material described in Art. I par. 1. of this contract to BIOtransfer after signature of this contract by both parties of the contract to the address above, where the assessment will be conducted by BIOtransfer. BIOtransfer will assess the material sent according to stipulations of this contract.

4. The material and all information provided within the framework of this collaboration are of strictly confidential nature. BIOtransfer will not disclose, without the MENDEL UNIVERSITY's prior written consent, to any third party any information which the BIOtransfer received or will receive in any form within the framework of this collaboration, after concluding this contract or even before this contract was concluded (confidential information) and keep the confidential information strictly confidential. The BIOtransfer will allow only BIOtransfer's employees who are bound by obligation to stay confidential about such confidential information access to the confidential information. The obligations under this paragraph will remain in effect even after this contract ends.

II. EXPERIMENTAL PROCEDURES

1. In planta Preventive application efficiency

Grapevine plantlets susceptible to Downy Mildew are treated with rGO-Cu-Zn, rGO-Cu, rGO-Zn, a rGO blank formulation, a copper reference (NORDOX) or water (untreated control).

rGO-Cu-Zn, rGO-Cu and rGO-Zn are each tested at 3 doses (to be defined with MENDEL UNIVERSITY). All the copper-based products will be applied at an equivalent copper amount. The rGO blank formulation will be tested at the highest dose.

All the treatments are performed using a hand-sprayer in order to apply a standardized mixture volume of 300 L/ha.

The day after the treatment (Preventive Treatment), leaf discs are cut from grapevine leaves and placed in Petri dishes containing an anti-senescence compound. Each leaf disc is inoculated on the abaxial side with a calibrated sporangia suspension of *P. viticola*.

Three repetitions of 6 leaf discs are considered for each condition. After inoculation, leaves are incubated in a climatic chamber under controlled conditions.

The Disease Severity Index is assessed at 7 days post-inoculation. The level of effectiveness of the products is given at each dose as a percentage of the untreated control and analyzed with a statistical software (XLSTAT, Addinsoft).

2. Biological material

- 1 Grapevine variety susceptible to *P. viticola*
- 1 *P. viticola* strain

3. Treatment procedure

- rGO-Cu-Zn at 3 doses (to be defined with MENDEL UNIVERSITY)
 - rGO-Cu at 3 doses (to be defined with MENDEL UNIVERSITY)
 - rGO-Zn at 3 doses (to be defined with MENDEL UNIVERSITY)
 - 1 reference copper (NORDOX) at 3 doses
 - rGO blank formulation at 1 dose (the highest of the above testes doses)
 - Untreated control
- Prepared in a volume of water corresponding to 300 L/ha. All the copper products will be applied at an equal copper amount.

4. Inoculation procedure

- 1 inoculation timing, 24h after the treatment
- 1 inoculum pressure
- 3 repetitions of 6 leaf discs per condition

5. Fungicide efficiency assessment

- 1 evaluation timing, 7 days after inoculation
- Criteria of biological efficacy: Disease Severity evaluation
- Statistical analysis of the results by using the XL-STAT (Addinsoft®) software

6. Number of conditions

[(rGO-Cu-Zn * 3 doses) + (rGO-Cu * 3 doses) + (rGO-Zn * 3 doses) + (rGO blank * 1 dose (1 reference copper * 3 doses) + untreated control] = 14 conditions

7. Outcome: Biological efficiency and their ranking of MENDEL UNIVERSITY's graphene-based nanocomposite products applied as a preventive treatment towards *Plasmopara viticola* on grapevine leaves.

III. EXECUTION OF THE RESEARCH PROGRAM

1. Properties of the results:

MENDEL UNIVERSITY has the exclusivity and the property of all results and intellectual property of this study, all of which is BIOtransfer obligated to hand over to MENDEL UNIVERSITY at the latest at the end of this contract. BIOtransfer is obligated to take all steps necessary for the MENDEL UNIVERSITY to be the sole owner of the results and intellectual property, in particular towards its employees who will handle the material and perform work for BIOtransfer regarding the material.

2. Responsibility:

Dr Thierry Barchietto head of the Phytopathology sector at BIOtransfer is responsible of the project.

3. Cost:

The total cost of 3 graphene-based nanocomposite products and copper reference all evaluated at 3 doses is 6 300 € VAT excluded (450 € per condition).

4. Duration of the contract:

2 months upon signature of the contract.

5. Financial terms:

Fifty percent (50%) of the global cost is paid in two weeks after the contract signature, 25% at midterm and the remaining sum (25%) at the end of the experimentation.

6. Transfer of the results:

BIOtransfer will transfer the results in a MICROSOFT POWER POINT® presentation in English language to MENDEL UNIVERSITY by sending email to: prenosil@mendelu.cz. at the latest at the end of the duration of this contract. If the contract ends prematurely, BIOtransfer will transfer all results it has thus far produced without undue diligence after the end of this contract.

7. Handling the material

After this contract ends for whatever reason, the BIOtransfer is obligated to return without undue diligence all materials and information which it received from MENDEL UNIVERSITY, but at the latest in 30 days after the contract ends. BIOtransfer is not authorized to keep any form of the material or information provided or of the results after the end of this contract.

IV. FINAL ARRANGEMENTS

1. This contract becomes valid on the date of signature of the contract. This contract comes into effect on the date of its publicization in the contract registry according to Act No. 340/2015 Coll., on Special Conditions for the Effectiveness of Certain Contracts, the Disclosure of These Contracts and the Register of Contracts (Act on the Register of Contracts). MENDEL UNIVERSITY will ensure the publicization of this contract in the contract registry; BIOtransfer hereby agrees with the publicization of this contract in the contract registry. BIOtransfer acknowledges, that MENDEL UNIVERSITY might be obligated to publicize or provide information about this collaboration according to the law of the Czech Republic to state authorities or third parties.
2. This contract shall be governed and interpreted in accordance with laws of the Czech Republic regardless of collision of legal systems. All disputes between the contracting parties arising out of this contract shall be decided by the court of the Czech Republic. The official language shall be the English language.
3. Any changes and amendments to this contract shall require a written form.
4. If any provision of this contract is determined to be invalid or unenforceable, the validity or enforceability of the other provisions either of this contract as neither a whole nor other provisions will be affected. Contracting parties hereby agrees to supersede such an invalid or unenforceable provision by a new valid and enforceable provision that most closely matches the intent and the purpose of the original provision.
5. This contract had been made in two duplicates from which each contracting party shall receive one copy.
6. The contracting parties declare that this agreement is an expression of their true and free will, and that it was not concluded in distress or under markedly unfavorable conditions. The parties hereto have read this agreement and they agree with its content, in witness whereof they affix their signatures.

Date 26.10.2022

Place ...Brno.....

.....signature.....

For MENDEL UNIVERSITY

prof. Dr. Ing. Jan Mareš

Rector of Mendel University in Brno

Date 28.10.2022

Place Montreuil

.....signature.....

For BIOtransfer

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BIOtransfer CEO