



ECPGR Activity Grant Scheme Proposal Form

Fourth Call

Activity Proposal

Activity	
Full title	Improving the characterisation and conservation of umbellifer crop wild relatives in Europe
Acronym (or short title)	CarrotDiverse
Duration of Activity (in months)	24
Starting date	1 st January 2017

Applying Working Group(s)

	Working Group	Indicate name and surname of Working Group Chair
1.	Umbellifer Crops	Charlotte Allender
2.		
3.		
4.		

Activity Coordinator

Activity Coordinator	
Name and Surname	Charlotte Allender
Nationality	UK
Current position	Director, UK Vegetable Genebank
Institute	University of Warwick
Country	UK
Telephone	+44 (0)2476 575014
Email	charlotte.allender@warwick.ac.uk

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Activity Partners

Please note that each partner needs to be a member of a Working Group's Pool of Experts to be eligible.

A maximum of 12 funded partners can be listed. For self-funded partners please use the separate box below.

Partner ID No.	Name and Surname	Institute	Country
1	Charlotte Allender	University of Warwick	UK
2	Emmanuel Geoffriau	Agrocampus Ovest INRA/ IRHS	France
3	Annette Hägnfelt	Nordic Genetic Resource Center	Sweden
4	Ulrike Lohwasser	Leibniz Institute of Plant Genetics and Crop Plant Research (IPK)	Germany
5	Violeta Lopes	Banco Português de Germoplasma Vegetal	Portugal
6	Thomas Nothnagel	Julius Kühn-Institut (JKI)	Germany
7			
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12			

Self-funded partners

Partner No.	Name and Surname	Institute	Country
1	Cristina Mallor Giménez	Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA)	Spain
2			
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Description of Activity

Please address the following aspects:

- *Background:* Explain the context behind the choice of this Activity, e.g. why this has been prioritized or selected. If this is the continuation of a preceding Activity, please indicate how and why the new Activity will build on previous results/experiences
- *Justification:* Explain why this Activity is justified in terms of making progress towards achieving the ECPGR objectives
- *Methodology or Approach:* Explain how the partners will operate. What are the respective roles and synergies they can add? Explain the rationale of meeting (or not) as part of the Activity.
- *Expected impact.* Clearly specify the expected impact from this Activity for the respective ECPGR objective(s), compared to the current state of progress of those same objectives. Explain how the impact will be obtained.
- *Links with other non-ECPGR projects or individuals:* If applicable, clearly explain the objectives of the linked projects and the reasons for complementarity with the ECPGR Activity.

Describe the Activity - (max. 1000 words):

Background and Justification

Carrot (*Daucus carota sativus* L.) is the most economically significant of the eight crops which are the focus of the Umbellifer Crops WG. Understanding the structure of CWR genepool diversity is an essential first step toward its effective conservation and use. A previous project in the WG focused on the identification of material for inclusion into AEGIS. This project will build on some earlier work looking at carrot CWRs and will use a collaborative phenotypic characterisation programme in combination with Genotyping by Sequencing to identify agronomically significant traits and allelic variants. We will also link with ongoing work outside of ECPGR to undertake preliminary work on the outline of a European component of a global integrated conservation strategy for carrot CWR.

Methods

The 24 month project can be divided into three distinct activities:

1. Development of European contribution toward global conservation strategy for *Daucus* CWR (all project partners).
 - a. This will be initiated by a meeting of all the project partners together with invited experts from The Crop Trust, Dr Charlotte Bickler (Royal Botanic Gardens, Kew) and a representative of the ECPGR Wild Species Conservation WG. The meeting will address the current global situation, identify other individuals or groups who should be consulted and begin the process of developing and contributing to a global strategy for *Daucus* CWR conservation, focusing on the actions which could be undertaken within the remit of ECPGR in particular. A gap analysis of material in European genebanks will be undertaken in conjunction with existing knowledge. This is a necessary first step toward the development and implementation of a coherent strategy to ensure adequate conservation *ex situ* and *in situ*. Project partners will also have the opportunity to consider the priorities for the WG as a whole in order to develop an outline workplan for the remainder of Phase IX and the beginning of Phase X. At this meeting, partners will have the opportunity to share information and current practices concerning the conservation of *Daucus* CWR *ex situ*, particularly in relation to protocols for viability and germination testing where dormancy can complicate results (RGB Kew has a useful historic data set). The panel of material selected for phenotypic and genotypic assessment will also be discussed and agreed.

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2. Characterisation and Evaluation of *Daucus* CWR
 - a. Field-based phenotypic characterisation of 30 accessions at each of three locations (Portugal, France, Sweden) will be undertaken in each of the two years of the project (50-60 accessions in total, depending on reproductive behaviour). Accessions will be selected from the available material held within European genebanks to be representative of the likely diversity of the CWR genepool (*D. carota* subspecies and other *Daucus* species as appropriate). Traits scored will include the minimum descriptors previously agreed by the WG, as well as scoring reproductive behaviour in terms of phenology. Digital images will also be taken to record overall phenotypes. The work will also provide a further opportunity to build on previous work in taxonomic verification of material held in ex situ collections through assessment by an expert taxonomist (France). A small number of landrace accessions will be characterised alongside CWR accessions (Portugal) for comparative purposes.
 - b. An evaluation of resistance of the selected material to common diseases of cultivated carrot (caused by *Alternaria daucii*, *A. radicina*, *A. alternata*) via inoculation of leaf material using techniques already in use (JKI, Germany).
 - c. The second meeting of the project partners will enable collation of preliminary characterisation data and an assessment of the approaches taken, along with any refinements needed.
3. Genotyping of *Daucus* CWR accessions
 - a. Leaf material will be harvested from 96 selected plants undergoing phenotypic characterisation and DNA extracted for Genotyping By Sequencing in Year 2. The exact accessions/individuals assayed will be agreed at the second meeting based on preliminary phenotypic data. Bioinformatic analysis of the raw data will be carried out using existing pipelines at Warwick and JKI. Association of SNPs with phenotypic characteristics, and patterns of diversity in genes involved in diseases resistance and reproductive biology will be assessed.

Expected Impact

The project will assist in meeting ECPGR Objectives 1, 2 and 3. The project will deliver a panel of appropriate, well characterised *Daucus* CWR as part of the European Collection. Previous work on AEGIS within the WG has focused on cultivated material. Phenotypic data will be made available after the project via the new developments in the EURISCO database, which will enable potential users to benefit from this work in the selection of appropriate material. It is also intended to produce a scientific publication which will highlight the material and the activities within the project to the scientific and breeding community. This project is the starting point in the process of development for a European component of an integrated ex situ/in situ global conservation plan for *Daucus* CWR, bringing together the Umbellifer crops WG and the Wild Species Conservation WG for the first time. Specific deliverables will include a report and action plan from the first meeting for circulation and consideration by the Umbellifer Crops WG, the Wild Species WG and any other relevant European and global stakeholders.

Links with other non-ECPGR projects or individuals

The project aims to develop a synergistic approach with other projects already in progress beyond ECPGR. These include the project "Adapting Agriculture to Climate Change: Collecting, Protecting, and Preparing Crop Wild Relatives" managed by The Crop Trust.

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Daucus CWR were one of the initial target groups focused on in this project, and a global gap analysis has been carried out, however this has not yet been integrated into an overall strategic approach for conservation. Related to this project RGB, Kew (UK) have recently begun work looking at wild carrot genetic diversity and germination behaviour, and the proposed project will seek to complement this work and benefit for Kew's historical germination data set. The proposed work complements ongoing work on carrot being carried out in the institutes of project partners, allowing the relevant national programmes to link together in a mutually beneficial manner.

Expected products and related ECPGR Objectives

List concrete products and results that are obtained by the Activity and the corresponding number(s) of the ECPGR Outcome(s) and/or Output(s) and/or Activities to which each product/result will contribute.

	Expected products/results	Corresponding ECPGR outcome, output, activity
1	Updated workplan and priorities for Umbellifer Crops WG including recommended practice for viability testing of <i>Daucus</i> CWR	Outcomes 1, 2, 3, 5 Outputs 1.2, 1.5, 2.2, 3.6, 5.3, 5.4 Activities 1.2.1, 1.2.2, 1.2.3, 1.5.2, 1.5.3, 1.5.4, 1.5.5, 3.6.2, 5.3.1, 5.4.1
2	Outline of European contribution towards global strategy for the conservation of <i>Daucus</i> CWR	Outcomes 3, 6 Outputs 3.6 and 6.3 Activities 3.6.1, 3.6.2, 3.6.4, 3.6.5, 6.3.1
3	Identification of a panel of key <i>Daucus</i> CWR accessions from European genebanks for inclusion in the European Collection	Outcome 1 Output 1.2, 1.5 Activities 1.1.2, 1.2.1, 1.2.2, 1.5.3
4	Characterisation data (morphology, disease resistance) from three locations for 60 accessions of <i>Daucus</i> CWR and associated genotypic data on these accessions	Outcomes 1,2,5 Outputs 1.2, 2.2, 5.3,5.4 Activities 1.2.1, 5.3.1, 5.4.1

Workplan for the proposed period of the Activity

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Brief description of meetings and/or main actions of the Activity.

	Type of Action (indicate if “meeting” or “other action”)
1	<p>Meeting (Month 3, Braga, Portugal) – All partners and external experts</p> <ol style="list-style-type: none"> 1. To bring project partners and external experts together to discuss the strategies needed for a global conservation strategy for <i>Daucus</i> CWR and share protocols for monitoring the health of ex situ collections 2. To develop priority activities for the Umbellifer Crops WG for future phases of ECPGR 3. To agree a panel of material for partners to jointly assess in the rest of the project.
2	<p>Other Action (Months 4-20, France, Sweden, Portugal, Germany)</p> <ol style="list-style-type: none"> 1. Field-based characterisation of ~60 accessions across three sites, assessing morphology and reproductive biology and providing data on impact of environmental conditions on phenotype, taxonomic verification 2. Evaluation of material selected for resistance to diseases of cultivated carrot
3	<p>Meeting (Month 14, Zaragoza, Spain) – UK, France Germany (IPK, JKI), Sweden,</p> <ol style="list-style-type: none"> 1. Collation and review of year 1 data, assessment of characterisation approach 2. prioritisation of samples for GBS analysis
4	<p>Other action (Month 18-23 - UK, Germany - JKI)</p> <ol style="list-style-type: none"> 1. Genotyping by Sequence analysis of 95 samples selected from plants scored during phenotypic characterisation 2. Associated data analysis
5	<p>Other action (Month 22-24 - All ECPGR project partners) Data collation, preparation of final report</p>

Additional remarks

Indicate any additional remark(s) that is/are important for the evaluation/implementation of the proposed Activity

<p>Remarks:</p> <p>The meetings are being hosted by partners (Portugal, Spain) with limited access to ECPGR funding in order to maximise interaction among the WG. Input from these partners will be sought electronically where travel is not possible. The participation of the Wild Species WG representative in the project will be funded by the Umbellifer Crops WG budget.</p>

**Please send the completed form together with the budget table to the
Chair of the submitting Working Group for submission of the Activity proposal.**