PROJECT DELIVERABLE REPORT
Deliverable 8.5 : FF-IPM Layman's Report

Fruit Flies In-silico
Prevention & Management
FF•IPM

Project Title:

In-silico boosted, pest prevention and off-season focused IPM against new and emerging fruit flies ('OFF-Season' FF-IPM)
SFS-2018-2

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 818184– H2020-SFS-2018-2

Grant Agreement Number	818184	Acronym	FF-IPM
Full Title	In-silico boosted, pest prevention and off-season focused IPM against new and emerging fruit flies ('OFF-Season' FF-IPM)		
Topic	SFS-05-2018-2019-2020 New and emerging risks to plant health		
Funding scheme	RIA - Research and Innovation action		
Start Date	1st September 2019	**Duration**	54 months
Project URL	http://fruitflies-ipm.eu/		
EU Project Officer	George PREDOIU		
Project Coordinator	UNIVERSITY OF THESSALY - UTH		

Deliverable	**D8.5 Layman's Report**			
Work Package	WP8 – DISSEMINATION			
Date of Delivery	**Contractual**	M42	**Actual**	M54
Nature	Document	**Dissemination Level**	Public	
Lead Beneficiary	RNDO Ltd.			
Responsible Researcher	Marianna Terzidaki	Email	terzidaki@rndo.eu	
		Phone		
Reviewer(s):	FF-IPM Consortium			
Keywords	Communication, Dissemination, Layman's Report			

Revision History

Version	Date	Responsible	Description/Remarks/Reason for changes
0.10	26.02.2024	RNDO	Structure of the Deliverable developed
0.20	28.02.2024	UTH	Revision of draft
0.20	29.02.2024	FF-IPM	Deliverable approved by the EB
1	29.02.2024	UTH	Submission of Deliverable

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➢ Executive Summary

The present deliverable outlines the development of the FF-IPM Layman's report, under WP8 Communication & Dissemination. This document is specifically tailored to convey the project's objectives, methodologies, achievements, and outcomes in a clear, accessible manner targeted at non-experts, namely the general public and project stakeholders.

The production of the Layman's report was planned to be delivered on M42 (initial time-plan before the extension) but it was strategically developed during the final phase when the majority of results designed in the project were consolidated and delivered together with the project's communication milestones (i.e final conference etc.).

In principle, the aim of a Layman's report is to simplify intricate information so that it becomes comprehensible and relevant to individuals lacking specialized expertise in the subject matter. Throughout the process of structuring the present deliverable, the compiling team consistently prioritized this principle.

➢ Introduction

This document is purposefully designed to cater to a broader audience, aiming to illuminate them on the project's objectives and the tangible outcomes achieved.

The FF-IPM Layman's report acts as a conduit for broadening the project's impact beyond its immediate implementation area. The main findings and outcomes are concisely presented in 24 pages containing images, graphs and provides all the essential information on facts and figures about the project.

The document of the Layman's report is uploaded at the project's website: https://fruitflies-ipm.eu/news-and-events/layman'sreport

➢ Document structure

The document features main sections tailored to engaging and informing the target groups about the following:

1. Summary of the problem, the challenge and the objectives: to provide an overview of the project's overarching goals and its significance in addressing environmental challenges.
2. Description of techniques/methodology and results: to articulate the methodologies employed within the project and detail the tangible outcomes achieved, showcasing the practical application of these approaches.
3. Communication & Dissemination: to offer an overview of the communication and dissemination impact derived from the project, bolstered by quantified data to underscore its significance.
4. Sustainability of project results: to highlight the potential for sustainability and marketability of the project findings and methodologies in other contexts, fostering broader impact and scalability.

By adhering to this structured format and content framework, the Layman's report endeavors to effectively communicate the essence and impact of the FF-IPM project to a diverse audience, thereby fostering broader understanding, engagement, and potential for future initiatives.

➢ Key Benefits

The present Layman's report provides the following key benefits:

1. **Communicating Complex Concepts**: The FF-IPM project involves scientific methods and technical terminology related to pest management and agriculture. The delivered layman's report simplifies these concepts, making them accessible to a wider audience.
2. **Increasing Awareness**: By highlighting the project's objectives and outcomes into easy-to-understand language, the present layman's report can raise awareness among stakeholders, policymakers, and the general public about the importance of the project's deliverables.
3. **Engaging Stakeholders**: The FF-IPM project layman's report can engage stakeholders who may not have expertise in pest management but have a vested interest in the project's outcomes, such as farmers, consumers, and environmental advocates. It can help them understand how the FF-IPM project benefits them and the broader community.
4. **Supporting Decision-Making**: Policymakers and funding agencies often require accessible summaries of project results to inform their decision-making processes. This document provides stakeholders with the information they need to assess the effectiveness and impact of the FF-IPM project.

Overall, the Layman's report serves as a valuable tool for effectively communicating the significance and impact of the FF-IPM project to a diverse audience, fostering understanding, support, and action towards sustainable agricultural practices.

The document of the Layman's report is uploaded at the project's website: https://fruitflies-ipm.eu/news-and-events/layman'sreport

➢ Conclusion

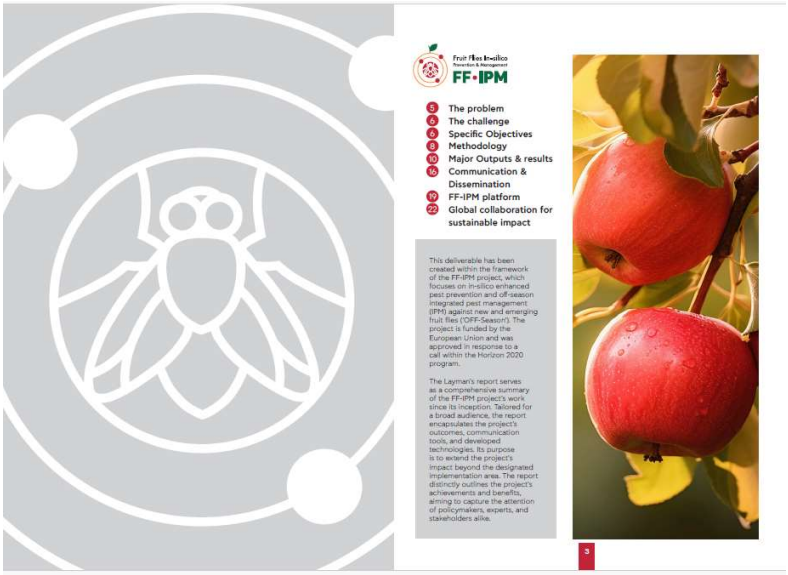
In conclusion, the present deliverable 8.5 within WorkPackage 8 Communication and Dissemination, generated for the FF-IPM project, exemplifies the project's dedication to accessibility, transparency, and making a meaningful impact.

Through its strategic crafting and structured content framework, this deliverable effectively communicates the essence and achievements of the project to a diverse audience, including non-experts, stakeholders, and policymakers.

With its concise presentation of key findings, methodologies, and implications, the report paves the way for continued collaboration, innovation, and positive change in the field of integrated pest management and beyond.

➢ ANNEX

Images of the Layman's report pages.


Fruit Flies In-silico Prevention & Management
FF•IPM
5 The problem
6 The challenge
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This deliverable has been created within the framework of the FF-IPM project, which focuses on in-silico enhanced pest prevention and off-season integrated pest management (IPM) against new and emerging fruit flies ('OFF-Season'). The project is funded by the European Union and was approved in response to a call within the Horizon 2020 program.
The Layman's report serves as a comprehensive summary of the FF-IPM project's work since its inception. Tailored for a broad audience, the report encapsulates the project's outcomes, communication tools, and developed technologies. Its purpose is to extend the project's impact beyond the designated implementation area. The report distinctly outlines the project's achievements and benefits, aiming to capture the attention of policymakers, experts, and stakeholders alike.
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Fruit Flies In-silico
Prevention & Management
FF•IPM
IN-SILICO BOOSTED, PEST PREVENTION AND OFF-SEASON FOCUSED IPM AGAINST NEW AND EMERGING FRUIT FLIES ('OFF-SEASON' FF-IPM)
H2020 -SFS-2018-2020/H2020-SFS-2018-2
INNOVATION ACTION (IA)
DURATION
1 September 2019 - 29 febrary 2024
TOTAL FUNDING
6.004.252,50€
EU FUNDED
COORDINATOR
21 PARTNERS
71 SCIENTISTS
17 COUNTRIES
54 MONTHS
www.fruitflies-ipm.eu
www.platform.fruitflies-ipm.eu
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818184. This publication reflects only the author's views and the European Union is not liable for any use that may be made of the information contained therein.
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The Problem
Invasive species that currently expand their geographic distribution and become introduced and established in previous pest free areas cause huge environmental and economic impacts. The problem of invasive pests is multidimensional and complex and requires high levels of integration and various approaches to be tackled. Climate change, intense human mobility, and trading have brought biological invasions at the forefront of threats for agricultural production worldwide.
True fruit flies, species of the Dipteran family Tephritidae, is perhaps the most important group of pests for fresh fruits and vegetables worldwide. Such invasive pests affect food production and cause high economic losses every year.
The Mediterranean fruit fly (medfly), the Oriental fruit fly (OFF) and the peach fruit fly (PFF) are three of the most important invasive fruit fly species. Medfly has been introduced and established through the Mediterranean basin since the 19th century. Because of climate change, during the past decades, more temperate areas of the Northern Hemisphere are gradually warming up and becoming suitable for this species resulting in a spread northward.
The other two pests (OFF and PFF) have expanded their geographic distribution to areas neighboring Europe and frequently arrive via infested fruits into Europe. More recently, detections of both species are reported in European countries.
VALENCIA
30% fruit production damage
AFRICA
$2 billion in annual losses
AUSTRALIA
$4.8 billion in annual losses
GLOBAL
16% of harvests lost to pests
CLIMATE CHANGE
MASSIVE FOOD TRADE
INCREASED MOBILITY
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The Challenge

The Horizon 2020 funded project FF-IPM - "Insilico boosted, pest prevention and off-season focused IPM against new and emerging fruit flies" aimed to introduce "in silico" supported prevention, detection and Integrated Pest Management (IPM) approaches for both new and emerging fruit flies, based on spatial modelling across a wide range of spatial levels, novel decision support systems and new knowledge regarding biological traits of the target species, fruit trading and socioeconomics.

Specific Objectives

- Understand the factors that determine the success of the installation of biological invasions in the context of climate change.
- Prevention of insect invasion process with the use of innovative tools which prevent the introduction of infested fruits and locate populations in the early stages of the invasion.
- Management of established species in out-of-season periods with biological control.
- New strategies based on the use of thorough ecological modelling, and appropriate hardware and software.
- In-silico boosting of current IPM tools.
- Contribution in the maintenance of the productivity and sustainability of the fruit producing industry in Europe.

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Methodology

The FF-IPM structure involved:

(A) BIOLOGICAL DATA COLLECTION (WP2)

- Process of laboratory and field experiments using wild fruit fly populations to gain insights regarding their biology and ecology.
- Collected data have been archived and used to generate a new set of published information and novel original data to feed modelling procedures focusing on wild populations of target fruit fly pests.

(B) METHODS AND TOOLS DEVELOPMENT REGARDING INTERCEPTION AND DETECTION OF INVASIVE FRUIT FLIES (WP3)

- Improvement/development of novel (prototype) of different e-traps for fruit fly detection.
- Development of mobile application for morphological identification of larvae and adults of target fruit fly pests.
- Development of molecular ID tools for fruit fly identification.
- Validation of e-Nose prototype for detection of fruit fly infested fruit.
- Application of new methods as FF OFF-Season-IPM tools.

(C) DEVELOPMENT AND ENHANCEMENT OF NOVEL BIOLOGICALLY SOUND TOOLS TO ADDRESS FRUIT FLY POPULATIONS OFF-SEASON (WP4)

- Development and enhancement of mass trapping devices.
- Novel entomopathogenic nematodes and fungi.
- Enhancement of functional biodiversity to address fruit flies.

(D) MODELS, STRATEGIES DEVELOPMENT AND PILOT-FIELD TESTING (WP5&6)

- Development and validation of prototype of a Decision Support – Alert System for invasive fruit flies.
- Development and validation of prototype for optimizing early detection system.
- Development and validation of Decision Suppose System tool (Virtual-Farm).
- Assessment of the socio-economic and environmental impacts of the management plans.

(E) SERVICES AND BUSINESSES ESTABLISHMENT AND PROVISION (WP7&8)

- Development of project's exploitation plan.
- Development of Business and marketing plan for novel interception, detection and IPM tools and methods.
- Development of communication and dissemination plan.
- Targeted stakeholders' engagement activities.

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Major Outputs & Results

Generation of new knowledge

Papers, project publications and presentations

FF-IPM generated new knowledge based on project results and outcomes and communicated and disseminated them via various channels such as journals, conference outputs, newsletters, articles and papers, presentations, and training modules.

DETECTION TOOLS

Improved Delta and MacPhail e-Traps

2 e-trap prototypes (McPhail and Delta) were developed based on previous projects for application under WP5 of the FF-IPM project and for its future commercialization.

The advanced prototypes developed included a sorting image analysis algorithm to discern and correctly identify the three target fruit fly species, and between the fruit fly species and other insect attracted and trapped by the McPhail e-trap.

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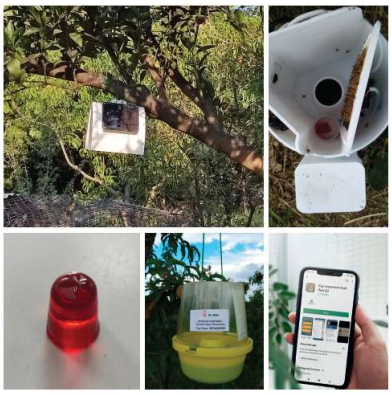

Mobile application for morphological identification of larvae and adults of target species

An electronic multi-entry identification key for fruit flies that are considered of significance for quarantine measures in the EU, has been created.

The key contains characters to differentiate between adults of 23 fruit fly species of the subfamily Dacinae, with links to other open access sources for additional information.

Available online through Google Play & Apple Store

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DS-Alert System

It is a complex system which aims to alert the organizations such as NPPO, to invasion risks from the fruit fly (Tephritidae) species of concern.

Early detection System

This system is an optimization strategy for surveillance of invasive fruit flies which sets out the overarching framework for general optimized surveillance plans.

Kobo-Fly

An attractive, simple-to-use system for collecting data in a robust, timely manner and storing it in a cloud-computing database. The app is based on the Kobotoolbox platform.

The system proved equally suitable and relevant for field or laboratory captures of trap catch data.

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INTERCEPTION TOOLS

E-nose

A novel, highly automated, non-destructive system that reliably identifies FF-infested from un-infested fruit.

ID molecular tools

Development of identification tools based on specific DNA sequences enabling identification of any life stage or of damaged specimens which cannot be identified by morphological characteristics.

LAMP

A molecular tool that allows rapid identification of intercepted specimens of the target fruit fly species without the need of a molecular laboratory, and thus applicable at points of entry.

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MANAGEMENT TOOLS

Virtual-Farm Decision Support and Service (DSS)

- Specialized software for locally adapted IPM strategies.
- Developed through stakeholder consultation and analysis of the project goals and expected end-user queries.
- Optimizes farm-specific IPM scenarios.

OFF-Season IPM Tool, application of entomopathogenic fungi

- Utilizes commercially available mycoinsecticide based on strains of the Beauveria entomopathogenic fungus.
- Tool for soil application in orchards against the Mediterranean fruit fly (medfly), *Ceratitis capitata*, in spring and/or in autumn (Off-Season).
- Application on the soil and mainly targets the late third instar larvae of fruit flies which leave the fruits and pupate in the soil.

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OFF-Season IPM tool, application of nematodes

- Utilizes commercially available nematode species for soil application against the Mediterranean fruit fly (medfly), *Ceratitis capitata* off-Season, in spring, and/or in autumn.
- Application on the soil and targets the late third instar larvae of fruit flies which leave the fruits and pupate in the soil.

OFF-Season IPM Tool, application of predator-based biocontrol

- Utilizes 3 different soil management techniques: bare soil (BS), straw mulch (M), and a green cover of the Poaceae Festuca arundinacea (FA).
- Manages *Ceratitis capitata* emergence in both OFF-Season and ON-Season periods.
- Different ground covers are associated with biotic (ground-dwelling predators) and abiotic (temperature, relative humidity and rainfall) mortality factors.
- Targets soil-associated stagesof *C. capitata* (late third instar larvae, pupae, and teneral adults).

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Communication & Dissemination

In addition to the communication and dissemination tools, the FF-IPM project included specially designed and targeted communication activities implemented throughout the project to enhance publicity, communication, and dissemination efforts.

STAKEHOLDER WORKSHOPS

Over 20 stakeholder meetings and workshops were conducted in different countries in addition to the final major stakeholder event.

SCIENTIFIC PUBLICATIONS

More than 20 scientific journal articles in peer review journals were published, while another 10 are submitted for publication.

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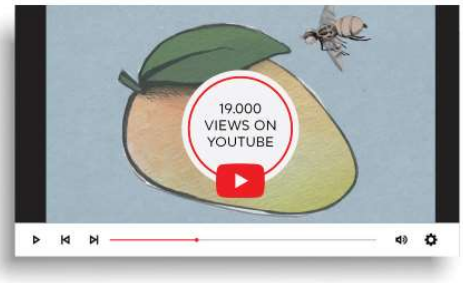

VIDEO

A promotional video was created to visually convey key project messages and achievements, offering scalable and cost-effective communication.

PRESENTATION AT CONFERENCES

More than 20 presentations of FF-IPM took place at national and international conferences, workshops, meetings and other events.

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WEBINARS

A series of webinars supported and organized by the FF-IPM Consortium were launched since April 2022.

These webinars are related to the FF-IPM project, its scope, deliverables, and scientific suggestions towards an in-silico supported Integrated Pest Management approach for the detection and prevention against new and emerging fruit flies.

TRAINING MODULES

A series of 25 training modules across 5 training entities were developed.

These training materials are used in training events and workshops and uploaded on the FF-IPM platform for continued availability to end-users/ stakeholders.

FF-IPM
WEBINARS

536 PARTICIPANTS 1.960 VIEWERS

Fruit fly detection and interception, the FF-IPM project response	Marc de Meyer	195	547
Insect-trapping & deployment strategy for surveillance of invasive fruit flies	David Hamel	160	400
Modelling the population dynamics of Oriental Fruit Fly, Bactrocera dorsalis: Progress and prospects for a real-time fruit fly forecasting system	Darren Kriticos	70	250
Perspectives for off-season control of the Mediterranean Fruit-fly	Dr. Amr Peters	60	220
Odorant-Based Detection of fruit fly infested fruits in cargo shipment	Dr Panagiotis Milonas	51	543

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FF-IPM PLATFORM

A cutting-edge web-linked end-user-friendly software infrastructure known as the FF-IPM Management Platform was developed.

Initiated at UTH, this platform plays a pivotal role in ensuring widespread and enduring stakeholder access to the wealth of knowledge generated as well as the tools, technologies, and services developed.

Get more information
www.platform.fruitflies-ipm.eu

TOOLS
Technical description of FF-IPM-developed tools

PILOT TESTING
Case study examples and genetic operational scenarios

SERVICES
Technical description of FF-IPM-developed experts services

PROJECT PUBLICATIONS
Copies of project publications, all published in open-access format

TRAINING MODULES
Customized training modules for key target stakeholder groups

RELATIVE RESEARCH DA
Copies of project research articles

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FF-IPM
Multi Actor Approach

KEY SOLUTIONS FOR COMMERCIAL EXPLOITATION

Several solutions within the FF-IPM portfolio present significant opportunities for commercial exploitation.

These include:

- Automated Pan-European Alert System: Providing real-time alerts for fruit fly presence.
- In-silico Boosted OFF-season IPM Paradigm: A comprehensive off-season integrated pest management approach.
- DSS-Alert: A system with spin-off potential, offering decision support for fruit fly management.
- E-Traps: Electronic traps designed for efficient fruit fly monitoring.
- E-Nose: Advanced electronic olfaction technology for early detection of fruit fly presence.
- FF-Alert Services: Specialized services for fruit fly detection and management.
- Virtual-Farm Services: Providing virtual solutions for effective fruit fly control.

Partners can offer consultancy, advanced data analysis, visualization/ mapping tools, customization, and technical support to facilitate effective and affordable FF control solutions.

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SUSTAINABILITY

The FF-IPM platform, while serving primarily as a marketing and dissemination tool, also provides flexibility for different levels of exploitation for each product/service. Partners are actively collaborating in various configurations to ensure the long-term sustainability of FF-IPM's results.

KEY FEATURES OF THE FF-IPM MANAGEMENT PLATFORM

Knowledge Accessibility

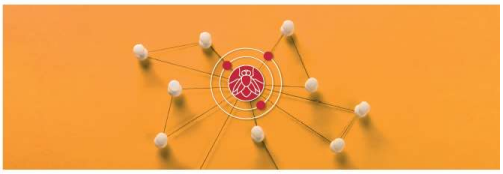
The platform serves as a unified gateway, providing public access to technical documentation and user-selected services. It acts as a repository, making project-generated technology insights and advancements accessible to the public, stakeholders, and end-users.

Technology Dissemination and Training

Beyond knowledge access, the FF-IPM Management Platform actively supports technology dissemination and stakeholder training under WP8. This ensures that innovative solutions reach a broad audience, fostering widespread adoption.

Inclusive Access Structure

The platform's technical infrastructure is dual-natured. It includes publicly accessible material for transparency and open access, along with secure, restricted content for registered end-users, offering a tailored and secure experience.



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GLOBAL COLLABORATION FOR SUSTAINABLE IMPACT
The FF-IPM project stands as a consortium of 15 EU partners, and additional contributors from South Africa, Israel, the USA, China, and Australia, operating on a global scale.
This diverse consortium is dedicated to providing scientific answers and practical solutions for stakeholders involved in fruit production and trading, not only in Europe but across the world.
UNIVERSITY OF THESSALY
VOLOS, GREECE
BENAKI PHYTOPATHOLOGICAL INSTITUTE
ATHENS, GREECE
AGRICULTURAL RESEARCH ORGANIZATION
BET DAGAN, ISRAEL
MUSÉE ROYAL DE L'AFRIQUE CENTRALE
TERVUREN, BELGIUM
INSILICO-IPM
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SPLIT, CROATIA
UNIVERSITAT JAUME I DE CASTELLON
CASTELLON DE LA PLANA, SPAIN
E-NEMA
SCHWENTINENTAL, GERMANY
CENTRE DE COOPÉRATION INTERNATIONALE EN RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT
SAINT-PIERRE, RÉUNION, FRANCE
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WIEN, AUSTRIA
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LISBOA, PORTUGAL
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VALENCIA, SPAIN
R&DO
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CORVUS
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