

**PLAN DE ACTUACIÓN
ACTUATION PLAN**

2014-2017

**INSTITUTO DE HORTOFRUTICULTURA SUBTROPICAL Y
MEDITERRANEA LA MAYORA**

IHSM

Versión 1. 22 de enero de 2014

1. Datos Generales / General Data



Código del Centro / Center Code:	090266
Tipo Centro / Center Type:	Centro Investigación
Titularidad / Ownership:	Mixto
Áreas Científicas / Scientific Areas:	Ciencias Agrarias
Dirección / Address:	ALGARROBO-COSTA 29750 Algarrobo
Teléfono / Phone:	95 254 89 90
Web:	http://www.ihsm.uma-csic.es/
Director:	ENRIQUE MORIONES ALONSO
Vicedirectores / Deputy Director:	
Gerente / Manager:	ANTONIO CORDON PEÑALVER
Constituido por / Established by:	Consejo Superior de Investigaciones Científicas (CSIC) UNIVERSIDAD DE MALAGA
Integrado por / Integrated by:	
Departamentos / Departments:	
Unidades Asociadas / Associated Units:	

2. Reseña Histórica / Historical Outline

2.1 Origen / Origin

Fecha de Constitución / Foundation Date: 01/02/2008

Entidades Fundadoras / Founder Entities: D. Rafael Rodrigo Montero, Presidente del CSIC y Dña. Adelaida de la Calle Martín, Rectora de la Universidad de Málaga

Primer Director / First Director: D. Enrique Moriones Alonso

2.2 Objeto con el que fue creado / Founding aim

The IHSM was created to join efforts of the research groups of the Estación Experimental La Mayora and plant research groups of the University of Málaga to potentiate research on intensive vegetable and subtropical fruit trees crops.

2.3 Reseña histórica extendida / Extended historical outline

The Instituto de Hortofruticultura Subtropical y Mediterránea "La Mayora" (Subtropical and Mediterranean Horticulture Institute "La Mayora") (from now on IHSM) is a joint institute between the Universidad de Málaga (from now on UMA) and the Consejo Superior de Investigaciones Científicas (from now on CSIC). The IHSM was created in February 2010 as a result of a fusion of the research groups of the Estación Experimental La Mayora (from now on EELM) and plant research groups of the UMA. Besides the scientific personnel from EELM and UMA, the farm and technical staff of the EELM are conserved to maintain the activity of the EELM experimental station now belonging to the IHSM. The institute was created with the objective of joining efforts of EELM and UMA to promote research and innovation in subtropical and Mediterranean horticulture. In addition, the IHSM should help to strengthen the productive sector of the region through knowledge transfer and through the education of techniques and specialists. Thus, the relevance of the IHSM should be understood in this sense, as the addition of the scientific and economic impact derived from its creation. The creation of a joint institute has allowed to generate an important pole of research in subtropical and Mediterranean horticulture and to coordinate more efficiently the research activities previously conducted in the EELM and UMA. The close collaboration between CSIC and UMA via the IHSM allows multidisciplinary research approaches to face challenges posed to the Spanish horticulture. The IHSM was born to become a national and international reference centre in subtropical and Mediterranean horticulture research. A priority of the IHSM is to strengthen the collaboration with the producing sector through knowledge and innovation transfer and improving formation of field technicians and specialists. Moreover, training personnel from developing countries of the Mediterranean basin, or from South America, Middle East and Asia is another objective of the IHSM. It is important to stress the great added value for the IHSM to incorporate the EELM experimental station, with a singular and advantageous geographical location, field plots and facilities in addition to having a trained staff, and germplasm bank collections (being that of cherimoya the world reference collection for this species), which contributed to its recognition among the producing sector. This experimental station is an essential part of the IHSM, critical to achieve successfully the planned objectives, allowing research on fundamental and applied aspects. The experimental station will be offered as service to external users, thus being a key for the intense collaboration that wants to be established between the IHSM and other research centres and with the producing sector. Location The IHSM has an excellent location, in one of the most dynamic agricultural areas of Spain (coastal areas of Málaga, Granada and Almería), with one the greatest concentration of subtropical fruit and intensive vegetable crops of the Mediterranean Basin. The headquarters of the IHSM will be localized in the Parque Científico y Empresarial (Scientific and Business Park) of the Teatinos Campus of the UMA in Málaga, at a short distance of the two other important agricultural research and technology development centres of Málaga, the Centro de Investigación y Formación Agraria (Agricultural Research and Training Centre) of Churriana (IFAPA, Junta de Andalucía), and the Parque Tecnológico (Technological Park) of Andalucía (PTA), respectively. The experimental station of the IHSM, the EELM, is located at La Mayora farm in Algarrobo-Costa, about 40 km from Málaga city, in the coastal area of la Axarquía (eastern Málaga). The farm was purchased in 1960 and facilities were inaugurated in 1968, initially within the frame of Spanish-German cooperation, and then integrated within the CSIC. The EELM is located at about 50 km from UMA, 50 km from the IFAPA of Churriana, 60 km. from the PTA, and 10 km from the Parque Agroalimentario (Agroalimentary Park) of Vélez-Málaga.

3. Organización / Organization

Descripción: Organigrama, Comités asesores externos, Estructura departamental, Líneas de investigación del Plan de Actuación 2010-2013 / Description: Organization chart, Steering Committees, Department structure, Research Lines (as establishes in the 2010-2013 Actuation Plan):

A Director and two Vice-directors, one of them in charge of the experimental station EELM, will compose the Management Board of the IHSM. The institute is organized in three departments (Department of Plant Breeding and Biotechnology, Department of Subtropical Fruits and Department of Plant Protection) structured in four research lines (RL): RL1: Improvement of quality and food safety of fruits RL2: Subtropical fruits. RL3: Plant-pathogen interactions RL4: Biology and control of plant diseases Additionally, the IHSM provides two services (S.): S1: Experimental Station La Mayora (EELM) S2: Management and General Services The EELM gives support to the research activities conducted at the IHSM and also gives external service organized by one of IHSM Vice-directors. The Management and general services provide support to the research groups of the IHSM and are under the control of the Manager of the IHSM. The institute operates under, the `Junta and the `Claustro. The `Junta of the Institute is composed by the director, the vice-directors, the heads of the departments, three representatives of the personnel, and the institute manager. The `Claustro is composed by representatives of the scientific staff and develops an intense activity in the Institute management, with frequent meetings. To coordinate the activities at the experimental station, the organization of the EELM is under the responsibility of four field technicians that work in close collaboration with the research scientists to guarantee a perfect development of field work in the research station and support to the different research activities.

4. Análisis DAFO / SWOT Analysis

4.1 Debilidades / Weaknesses

- 1.- Lack of sufficient research critical mass and, consequently, the necessity of additional researchers to foster some strategic areas of research. Lack of researchers with expertise on plant metabolomics, proteomics, fruit quality, functional genomics, cell biology, and bioinformatics among the lines of research is observed.
- 2.- Management structure in CSIC. The lack of sufficient management personnel results in an excess of administrative tasks for scientists that puts at risk the implementation of research projects, mainly large projects involving different research groups, detracting scientific competitiveness.
- 3.-Lack of permanent and specialized technical staff in laboratory support structures to maximise research efficiency
- 4.- Low number of postdocs that can incorporate new ideas and innovative research projects and help to supervise the daily tasks in the laboratory.
- 5.- Scarce participation in international projects and research programs funded by EU.
- 6.- The localization of the IHSM central building at the University campus in Malaga, 50 Km away from the experimental station, where plantations and greenhouses are located, would required additional effort and resources of management.
7. Old laboratory facilities available at EELM facilities wit more than 50 years old, that cannot be adapted to modern laboratory requirements and self-security working conditions.
- 8.- The lack of specific scientific equipment needed for the future laboratories of the IHSM raised from the joining of researchers from the former EELM and UMA.

4.2 Amenazas / Threats

- 1.- Continuous changes in research objectives and funding priorities in Agriculture.
- 2.- The relative diminishing priority of agricultural research in national and European programs in recent years.
- 3.- Limited possibilities of increasing the financial support by the producing sector due to the characteristics of this sector (dispersed and with low commitment to research) and its concentration in a geographically small area
- 4.- The lack of appropriate extension agents to fill the gap between the stakeholders and the researchers requires the involvement of the research groups in extension work.
- 5.- Lack of acceptance of GMOs in Europe can hamper applicability of genotypes to be developed.
- 6.-Limitation of technical staff positions: the reluctance of CSIC and UMA to provide financial support to create technical staff positions can result in management problems in middle term, at the scientific level and, especially, in the Experimental Station.
- 7.- Lack of stability of an essential part of the specialized staff working at the EELM. Temporal contracts are frequent that are not attractive to maintain specialized workers essential to perform experimental work in the EELM.
- 8.- Reduced attractiveness of research in agricultural aspects is causing problems to locate postdoctoral and PhD students which hampers research capacity and the renewal of scientists.
- 9.- Dramatic reduction of the financial support for research from of the central and regional governments.
10. Progressive retirement of about 25% of the permanent staff available to manage the experimental station during the next 5 years.
11. Lack of budget to ensure construction of the central research building of the IHSM at the UMA Campus. This building is essential to locate the new modern laboratories needed to allocate scientists of the IHSM.

4.3 Fortalezas / Strengths

- 1.- Excellence of research groups with complementary expertise on plant breeding, molecular genetics, molecular biology, biochemistry, physiology, microbiology, plant pathology, and plant protection.
- 2.- Experimental Research Station (EELM) available with singular facilities and specialized personnel, with knowledge of current horticultural practices and wide experience in management of subtropical fruit tree species and vegetable crops for applied studies.
- 3.- Excellent geographical situation of the EELM in the core of the main vegetable and subtropical fruits producing area in Europe.
- 4.- Location of IHSM headquarters in the campus of the University of Málaga allowing close interaction with scientific groups with different expertise.
- 5.- Participation in postgraduate programmes of the University of Malaga, which allows to recruit applicants for research training grants.
- 6.- Scientific facilities. The University of Málaga facilitates to the IHSM singular scientific equipment centralized services and research facilities such as at the Genomics and Biocomputation Centre or the Andalusian Platform for Bioinformatics.
- 7.- Valuable germplasm bank collections of living subtropical fruit tree species and seed banks for melon, tomato and wild relatives, and expertise on maintenance of plant materials.
- 8.- Valuable microbial collections. Collections of the phytopathogenic viruses, bacteria and fungi.
- 9.- Good integration of traditional techniques with new biotechnological approaches towards the accomplishment of a common goal.
- 10.- Close relationships with the producing sector and connections with horticultural companies.
- 11.- Uniqueness. The IHSM concentrates the only group in the CSIC working with subtropical fruit tree species and one of the very few working in this topic in Spain and Europe. Similarly, the IHSM concentrates the only groups in the CSIC and one of the very few in Spain working on applied research in Mediterranean intensive vegetable crops.
- 12.- Strong and solid scientific collaborations with research groups having complementary expertise at both national and international level.

4.4 Oportunidades / Opportunities

- 1.- Research on vegetable and subtropical fruit tree species not subsidized and over demanded in the European Union.
- 2.- Scarce scientific knowledge on subtropical fruits since research on these species is being carried out in very few developed countries.
- 3.- Increasing social demand for healthy fruits with the lowest pesticide residues, and rationale use of water resources with increased conservation of natural and agricultural ecosystems, which will require research to develop genotypes ecologically and commercially better adapted and the improvement of crop management techniques to reduce the use of chemical substances.
- 4.- The production of subtropical fruit tree species under our conditions, away from their centres of origin, allows an easier incorporation of organic production compared to other fruit tree species where pests and diseases are more frequent.
- 5.- Increased prices of food will lead to increased resources on agricultural research.
- 6.- Large-scale national and international scientific initiatives are underway such as genomic-proteomic-metabolomic projects in which groups of the IHSM can participate with the added value of having germplasm banks for genetic diversity available in the IHSM.

7.- Complementation between international cooperation and the development of specific national research strategies to take advantage of the specificities of the Spanish producing sector such as proximity to European markets.

8.- Knowledge transfer. The close connection of the EELM with the producing sector is an opportunity to establish collaborations to transfer knowledge and innovations produced by the research groups of the IHSM.

9.- Biotechnology companies collaboration. Location of the IHSM within the campus of the University of Málaga, close to the Parque Tecnológico de Andalucía offers the opportunity to research groups to collaborate with dynamic companies of the biotechnological sector interested in knowledge transfer.

10.- Development of horticulture and high quality research in developing countries of the Mediterranean-North African and Latin America areas of influence that offers the opportunity to IHSM research groups to increase international cooperation with those developing countries

4.5 Ventajas Selectivas / Selective Advantages

1.- A unique multidisciplinary research on subtropical fruit tree species and Mediterranean vegetable crops, with good integration of traditional techniques with new biotechnological approaches and capacity to carry out basic research as well as technology improvement.

2.- Availability of an Experimental Research Station with an excellent location to perform research in subtropical fruit species and Mediterranean crops, unique in Spain and also in Europe, with a large experience of research recognized at national and International levels.

3.- Stable collaborations with Spanish and foreign research groups that can result in new scientific challenges and funding resources.

4.- Construction of the central research building of the IHSM at the campus of the UMA, with all the facilities needed for research and the additional possibility to use the highly technology services of the University of Málaga and establish interdisciplinary collaborations with scientist from others fields (chemistry, engineering, mathematics, informatics, etc..).

5.- Availability of high quality plant material of subtropical fruit trees and Mediterranean vegetable crops conserved in valuable germplasm collections.

5. Objetivos y Estrategias / Objectives and Strategies

5.1 Objetivos Generales / General Objectives

The main objective of the IHSM is to increase the competitiveness and scientific quality by performing high standard research in subtropical fruit and Mediterranean vegetable crops based in multidisciplinary approaches. Both applied and fundamental studies will be conducted to find solutions to the existing and potential problems that arise in an effective sustainable utilization of inputs and genetic resources to optimize production. The generation of scientific knowledge to be applied to get healthier and safer fruits, with the maximum respect to the environment and human health and with nutritional advantages will be a must. In this sense, a better understanding of the biology and bases of plant pathogen interactions will help to develop effective and durable strategies to control plant diseases with the lowest environmental and human health impact. Moreover, new developments such as production of fruits as functional food will be explored to increase the added value of the production. This main research objective will be attained in close collaboration with the producing sector making a strong effort to transfer knowledge useful to increase the value of their activity. Also, a strong effort for training and education of PhD and postdoctoral students coming from developing countries and of technicians will be done. Multidisciplinary research approaches will be conducted to achieve the specific research objectives for the period 2014-2017 further indicated in the following section. For this, collaborative efforts will be increased and internationalization will be enhanced in all the lines to increase the international visibility of the Centre.

5.2 Actuaciones Generales Propuestas / Proposed General Actuations

According to the SWOT analysis the strategy will take advantage of the main strengths and opportunities to alleviate the threats. Thus:

- The uniqueness of the IHSM in subtropical fruit and Mediterranean crops research, with multidisciplinary research with good integration of traditional and new biotechnological approaches, can help to search new funding resources (mainly in the private sector) to palliate the reduction of financial support from public institutions and the diminishing priority of agricultural research in national and European programs .
- The opportunity of the close relationships with the producing sector and excellent and continuous interactions with the breeding companies, together with the wide experience in management of field experiments, should be also further exploited to find additional sources for research funding. Although the intense work and frequent interaction with growers can be considered as a threat due to the time and resources needed, it can palliate the lack of appropriate public extension agents, and it could be used as an opportunity to tighten the relationships with the producing sector due to the strengths discussed in the previous points.
- Participation in postgraduate programs and increasing international cooperation can help to palliate the threat of the difficulty to find postdoctoral and PhD students caused by the reduced attractiveness of agricultural research.
- Uniqueness of the experimental research station EELM allows to offer services that can help to find additional resources to maintain a high qualified staff and technicians to alleviate the threat of limited amount of new positions for technical staff to manage the EELM .
- Unique germplasm collections of the IHSM can allow the utilization of natural variability as an important strategy to develop genotypes interesting for the producing sector thus palliating the threat of the little acceptance of GMOs in Europe.

Similarly, we will try to take advantage of our strengths to overcome the main weaknesses and take profit of our opportunities.

- Research on vegetable and subtropical fruit tree species non surplus in the EU, social demand for healthy fruits, together with increased prices for food and easy knowledge transfer in the IHSM are an opportunity to justify the recruitment of new the scientific staff and scientists that palliate the lack of researchers in specific areas and the low critical mass of the IHSM, that will be strengthened by the nearby retirement of several researchers.
- The large-scale national and international scientific initiatives that are underway such as genomic-proteomic-metabolomic projects in which groups of the IHSM can participate with the added

value of the strength of having valuable germplasm banks for genetic diversity can help to overcome the weakness of the scarce participation in international projects and research programs.

- The incorporation of developing countries to high quality research in the species studied in the IHSM is an opportunity to incorporate postdoctorals coming from these countries thus avoiding the weakness of the low number of postdocs in the IHSM.

- Consolidation of the IHSM as an international reference research centre. Uniqueness of the IHSM integrating traditional techniques with new biotechnological approaches and strong and solid scientific collaborations can help to make it an international reference centre. This might facilitate the recruitment of new scientists thus overcoming the weakness of the small research critical mass.

- The strong ties with other research groups both nationally and internationally will also help to alleviate the small critical mass of the IHSM.

5.3 Objetivos Científicos / Research Objectives

Four main research lines have been contemplated in the IHSM strategic plan, that in a close interaction and with multidisciplinary approaches will help to achieve the general objective. For this, as indicated in the specific strategic plans, a number of specific scientific objectives are planned to be tackled during the studies performed within the course of this strategic plan. The specific objectives of each research line can be summarized as follows:

Research line Subtropical fruits. The main objective of this research line is a sustainable utilization of genetic resources to optimize production in subtropical fruit tree species both under the current environmental conditions as well as taking into account climate change predictions combining basic and applied approaches along the following specific objectives: 1. Study, characterization, conservation and utilization of germplasm. 2. Implications of reproductive biology in yield in subtropical fruits. 3. Development of new cultural techniques to improve productivity and quality. 4. Selection of plant material for its use in breeding programs. 5. Tissue culture and genetic transformation. 6. Food web engineering.

Research line Improvement of quality and food safety of fruits. 1. Identification of genetic elements involved on the accumulation of soluble solids, organic acids, vitamin C, allergens, flavonoids, and anthocyanins through QTL analysis and identification of genetic determinants in strawberry and tomato. 2. Interaction of quality traits with the environmental conditions that can be modulated by cultural practices. 3. Molecular and structural bases of cuticle formation in tomato fruits. 4. Study of genes and hormones regulating development and the ripeness process in strawberry. 5. Identification of QTL and genetic components involved in pathogen/insect resistance to tomato, and melon. 6. Identification of physiological parameters in root and shoot related with water use efficiency of tomato grown under greenhouse. 7. Role of plasma membrane repair and sterol signalling in drought stress tolerance.

Research line Biology and control of plant diseases The main objective of this research line is the study of the etiology, epidemiology and control of important diseases of relevant subtropical and Mediterranean crops, as well as in the characterization of the biology, pathogenesis, virulence and ecology of bacteria and fungi that cause them. The plant diseases in which we currently work are: 1. Bacterial diseases: apical necrosis of mango by *Pseudomonas syringae* and olive knot by *Pseudomonas savastanoi*. 2. Fungal diseases: mango malformation by *Fusarium* spp, avocado root rot by *Rosellinia necatrix*, and cucurbit powdery mildew by *Podosphaera fusca*.

Research line Plant-pathogen interaction. The main aim of the research line is the identification of strategies to control disease in horticulture crops of economic importance, through the understanding of the molecular interactions taking place between the plant host, the pathogen, and the transmitting vectors. We aim to develop robust and durable strategies, compatible with integrated production systems with a low impact both for the environment and human health. 1. Population studies on plant-pathogen interactions (viruses). 2. Genetic and molecular mechanisms of plant defences against pathogens (viruses, bacteria and fungus): mechanisms of resistance against disease. 3. Interactions between the plant and the different viruses with the transmission vectors.

5.4 Actuaciones Científicas Propuestas / Scientific Proposed Actuatiions

(Información no disponible)

5.5 Objetivos de Transferencia de Tecnología / Technology Transfer Objectives

1. Strengthen connections with private companies through research projects and contracts that will facilitate the transfer of the generated scientific knowledge.

2. Strengthen connections with groups and institutions in developing countries to transfer the results of the research.
3. Protection and transference to seed companies of achievements such as a tomato variety resistant to spider mites or a tomato rootstock with improved water use efficiency.
4. Foresee the protection, under the present patent law, of genes that improve fruit quality.

5.6 Actuaciones en Transferencia de Tecnología / Technology Transfer Proposed Actuations

Increased strengthen of connections with breeding and horticultural companies and with growers and technicians through research projects and contracts will facilitate the transfer of the generated scientific knowledge. Protection and transference to seed companies of a tomato variety resistant to spider mites and of a tomato rootstock with improved water use efficiency is expected. Interaction with spin-off companies will be empathized to increase direct transfer of the scientific knowledge acquired. Also, due to the lack in the Spanish system of figures similar to the extension agents present in other countries, the transfer of results to the producing sector will continue to be an important objective to fill the gap between the stakeholders and the researchers. To accomplish this goal a closer ties with the producing sector will be established to transfer the results of the research. This implies new contracts with private companies and institutions.

5.7 Objetivos de Formación / Training Objectives

1. Supervision of PhD and Master theses of University students taking a pro-active role in recruiting graduate students and post doctoral associates both from Spain and from foreign countries.
2. Coordination and teaching in Masters and Doctorate courses and in Graduate courses.
3. Training of technicians.

5.8 Actuaciones Propuestas en Formación / Training Proposed Actuations

1. Coordination and participation in Master and Doctorate courses of the University of Málaga.
2. Organization of courses to improve the technical training of farmers and technicians.
3. Disclosure courses and seminars.

5.9 Objetivos de Divulgación / Outreach Objectives

1. Dissemination activities promoting the external visibility of the IHSM. These activities include the transfer of knowledge directly to growers who can apply for visits to the EELM together with the development of open day activities: week of science, tours to the fruit orchards, attendance to visits from high schools and universities.
2. Publication of articles in non-scientific journals as well as in local and national newspapers and radio and TV programs.

5.10 Actuaciones Propuestas en Divulgación / Outreach Proposed Actuations

The members of the IHSM will continue with the current dissemination activities promoting the external visibility. These activities include the transfer of knowledge directly to growers who can apply for visits to the Experimental Station, together with the development of open day activities: week of science, tours to the fruit orchards, attendance to visits by high school, technical and university students, etc. Similarly, the members of the IHSM plan to continue to publishing articles in non-scientific journals as well as in local and national newspapers, radio and TV programs. Relationships with technical staff of local administration of villages close to the Experimental Station also provide opportunities to disseminate the research activity

of the IHSM.

5.11 Objetivos de Internacionalización / Internacionalization Objectives

1. Maintenance of solid and stable collaborations with research groups of different countries (detailed in the strategic plans of the research lines) using national and European research programs.
2. Training of PhD students and researchers from international partner laboratories in the context of collaborations or Master programs.
3. Publication of articles in scientific journals in collaboration with international partners.

5.12 Actuaciones Propuestas en Internacionalización / Internacionalization Proposed Actuations

The members of the IHSM maintain solid and stable collaborations with research groups of different countries. The objective is to maintain the current international collaborations increasing the number of joint projects (mainly through AECID, Fontagro, bilateral actions, and EU programs) as well as establishing closer collaboration ties with groups of reference in basic research aspects and with other groups in Europe and the USA. Similarly, an effort will be made to attract international students and postdocs. In the last years a big effort has been made to transfer the results of research to groups in different developing countries. It is planned to continue and strengthen this strategy in the following years.

6. Indicadores de Seguimiento (Objetivos Cuantitativos) / Monitoring Indicators (Quantitative Objectives)

6.1 Objetivos Cuantitativos / Quantitative Objectives

Los indicadores de seguimiento se han calculado asumiendo que se mantiene la oferta de financiación pública para la investigación en los niveles realizados en 2012.

En los indicadores correspondientes a los congresos solo se han introducido los que corresponden a ponencias invitadas.

7. Servicios Científico-Técnicos / Scientific & Technical Support Laboratories

7.1 Listado de Servicios / List of Scientific & Technical Support Units

[010] Nombre del Servicio: Experimental Station 'La Mayora'

[020] Tipo de Servicio: Científico

[030] Responsable Científico: Enrique Moriones Alonso (Director)

[040] Responsable Técnico: Antonio Cordón Peñalver (Manager)

[050] Descripción del Servicio:

La Mayora Experimental Station (Estación Experimental La Mayora, EELM) is the main research service for applied research on subtropical fruit and Mediterranean vegetable crops in Spain. It is situated in Algarrobo, on the Málaga coastal area, taking advantage of a subtropical climate which is ideal for many crops ranging from semi-temperate to tropical. Being only 45-minute drive from Málaga University, the EELM is ideally located to host national and international researchers of co-operative research projects in order to conduct field studies. The EELM is located in a very dynamic region for intensive production of subtropical fruit trees and vegetable crops, facilitating the close contact, interaction and knowledge transfer with end users. The EELM belongs to the Instituto de Hortofruticultura Subtropical y Mediterránea (IHSM), and offers the service for experimental field studies to Agricultural Science institutes of the CSIC and to other potential users such as universities or private companies, within collaboration/contractual schemes. The 50 ha research facility of EELM in Algarrobo boasts a modern laboratory complex with biotechnology facilities, glasshouses, plastic houses, fields for annual crops, orchards, and a number of walk-in growth chambers. The Station also has a 18 room residence facility. About 22 ha can be used for growth of vegetable and subtropical fruit tree crops: open fields for vegetable (3.5 ha) or subtropical fruit tree (ca. 16.5 ha) crops, plastic houses (1.9 ha), glasshouses with confinement level N-1 and N-2 with temperature control (900 m²), 3 newly-built plastic houses with confinement level N-1 with and sectored irrigation/fertilization automated control (1,800 m²) able to successfully grow genetically-modified plants under conditions similar to those of commercial cropping, and growth chambers (5 chambers of 12 m²) with temperature, light and relative humidity control. The access to these facilities is through payment of internal or external fees that are available on request. A team of about 16 staff qualified personnel highly trained to conduct experimental field studies is available at the EELM. This team is coordinated by 4 technicians that are the link between researchers and the field workers to perform a co-ordinated team approach. There is a new-brand glasshouse facility (400 m²) built in the new campus of Málaga University that is serviced by one UMA employee.

[060] Página web del Servicio:

[070] Ámbito del Servicio: Interno

[080] ¿El Servicio tiene Certificaciones ISO?: NO

[090] ¿Está en la Red de Servicios Científico-Técnicos CSIC?: NO

[100] Facturación Interna 2010-2012 (k euros): 92

[110] Facturación a otros Centros CSIC 2010-2012 (k euros): 65

[120] Facturación a Universidades 2010-2012 (k euros): 3

[130] Facturación a Empresas 2010-2012 (k euros): 354 (facturación de finca, venta de frutas, ...)

[140] Número de grupos usuarios diferentes: 4 (all from Institute)

[150] Personal entrenado en el uso de equipos 2010-2012: 16

[010] Nombre del Servicio: Management and General Services

[020] Tipo de Servicio: Especial

[030] Responsable Científico: Enrique Moriones Alonso (Director)

[040] Responsable Técnico: Antonio Cordón Peñalver (Manager)

[050] Descripción del Servicio:

This service integrates the Administrative Management Unit, the Library, the General Maintenance, the Informatics, the Residence, and other general services of IHSM such as reception, driving, vigilance, warehousing, and cleaning.

The personnel attached to this service is a manager, a payer, two technicians, one administrative in charge of purchasing, , one receptionist, one vigilant, two librarians, one TIC person, a gardener, four general maintenance persons, a and a specialized cleaning person. The informatics is serviced by just one person recently recruited who is helped once a week by a professional from an external company General cleaning of the premises, night vigilance, and transport service to and from the EELM is done by contracted external services. The Service is also in charge of managing the EELM Residence.

As an example of multiplicity of this service is that the EELM is housing a telescope that belongs to the IAA-CSIC (Instituto de Astrofísica de Andalucía) to which the Service provides support by means of informatics network, general maintenance and lodging in the Residence of IAA researchers.

Activities of public outreach such as visits to the EELM are coordinated from this service, and in the period 2010-2012, 35 visits were held totaling 1,500 people from diverse places and expertises (e.g, farmers from Reunion Island, French agriculture students, almost all the Secondary Schools from our surroundings, ...). For the period 2013-1015 we estimate a 20% increase in the number of activities (so far, a number of 18 have been held in 2013 with about 1,000 visitors).

The Service outdates de Institute webpage, the CSIC corporate databases and the presence in social networks (Facebook, Twitter, Youtube). It is also responsible for the communication with the media.

[060] Página web del Servicio:

[070] Ámbito del Servicio: Interno

[080] ¿El Servicio tiene Certificaciones ISO?: NO

[090] ¿Está en la Red de Servicios Científico-Técnicos CSIC?: NO

[100] Facturación Interna 2010-2012 (k euros): 0

[110] Facturación a otros Centros CSIC 2010-2012 (k euros): 0

[120] Facturación a Universidades 2010-2012 (k euros): 0

[130] Facturación a Empresas 2010-2012 (k euros): 32,5 (Residence)

[140] Número de grupos usuarios diferentes: 4 (all from the Institute)

[150] Personal entrenado en el uso de equipos 2010-2012: -

7.2 Debilidades y Amenazas Generales / General Weaknesses and Threats

During the last 10 years the Services' staff have been progressively reduced because of retirements while the tasks have been increased. The location of the Institute and the economical situation of CSIC but also the structure of CSIC that favours laboratory and scientific personal recruitment do not help for the recruitment of new administrative and general services staff together with the intermediate classification of the Institute that does not suit well with the complexity of the management of the experimental station and a Instituto Mixto structure. The Experimental Station service is in great part maintained by temporary contracting of auxiliary workers but that cannot be done for administrative permanent personnel whose average age is as high as 57 y.o. The proportion of eventual personnel in the experimental station (equivalent to 8 men.year) is as high as one third which is a very dangerous situation as if without this personnel the greenhouses and orchards could not be properly maintained.

The large facilities at the experimental station needs of annual functioning costs that are covered just for repairing and essential maintenance but seldom for improvement. A number of the greenhouses, growth chambers, irrigation systems, etc. are getting old and soon they will be obsolete. The never-ending rising of energy costs, particularly those of electricity, makes difficult to keep the economical balance of the service.

7.3 Propuesta de Soluciones / Proposed Solutions

Solutions would be the application of existing administrative rules through the OEP and reposition of retired staff, the fixing of eventual personnel, and the reclassification of the Institute to allow more resources. The Experimental Station should be included within the CSIC Scientific Services Network. The University of Málaga should also contribute with administrative staff for the Institute.

8. Grupos de Investigación / Research Groups

8.1 Grupos de Investigación / Research Groups

Biología y control de enfermedades de plantas

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

4. Biotechnology

4.3. Innovative and competitive platform technologies

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

VICENTE MORENO, ANTONIO DE

Objetivos

Se llevan a cabo proyectos de investigación sobre diferentes objetivos relacionados con la etiología, epidemiología y control de enfermedades de cultivos subtropicales y mediterráneos relevantes, así como en la caracterización de la biología, patología, virulencia y ecología de los patógenos causantes de las mismas. Las enfermedades en las que actualmente trabajamos son: (1) necrosis apical del mango por *Pseudomonas syringae* y (2) tuberculosis del olivo por *Pseudomonas savastanoi* (control, factores de virulencia, toxinas, plásmidos, especificidad de huésped, desarrollo de la patogénesis), como modelos de etiología bacteriana; y como modelos de etiología fúngica: (3) malformación del mango por *Fusarium* spp., (4) podredumbre radicular del aguacate por *Rosellinia necatrix* y (5) oídio de cucurbitáceas por *Podosphaera fusca* (etiología, diversidad, profilaxis, control biológico, resistencia a fungicidas, interacciones multitróficas). Dichos objetivos se están abordando desde diferentes enfoques metodológicos que van desde la Fitopatología convencional hasta las aproximaciones genómicas (secuenciación de genomas y plásmidos, análisis transcriptómico y genómica funcional). Para el adecuado desarrollo de estos objetivos a corto-medio plazo sería deseable corregir los siguientes problemas: - Personal: El grupo tiene ciertas carencias en cuanto a personal que pueda liderar líneas relacionadas con la biología y el control de patógenos y enfermedades de postcosecha, en particular de frutas subtropicales (Científico Titular). Asimismo en 2012-2014 han finalizado sus Tesis 12 estudiantes en el grupo, por lo que es necesaria la incorporación de nuevo personal investigador en formación, entre otros por el Programa JAE-Pre. Asimismo el grupo cuenta con un solo JAE-Doc que finaliza en Noviembre 2013, y el grupo agravará su carencia de personal postdoctoral con experiencia, por lo que es crítico poder reincorporar personal postdoctoral, en particular por la vía JAE-Doc, actualmente 7 doctores formados en el grupo están realizando estancias postdoctorales en diversos laboratorios internacionales. Finalmente es importante para el grupo incorporar personal técnico de apoyo. - Equipamiento: Consideramos muy importante poder contar en los próximos años, al menos en el nuevo edificio del IHSM, con un laboratorio de nivel 2 de bioseguridad que permita trabajar con patógenos de cuarentena. También es clave equipar a dicho edificio con cámaras de cultivo e plantas visitables, y alguna de ellas también con nivel 2. También sería necesario un microscopio confocal. - Espacios: Las necesidades de espacio del grupo son evidentes, el espacio actual es limitado y bastante deteriorado, aunque estas necesidades deben centrarse en la construcción del nuevo edificio del IHSM, donde el grupo podrá acceder a nuevos espacios de laboratorio; ampliando las actualmente disponibles y especializando las instalaciones en función de los microorganismos de trabajo (hongos-bacterias, patógenos-BCA). - También resulta fundamental contar con personal para la administración y gestión de los proyectos de investigación.

Different research projects are being conducted by our group, with aims in the etiology, epidemiology and control of diseases of relevant subtropical and Mediterranean crops, as well as in the characterization of the biology, pathogenesis, virulence and ecology of bacteria and fungi that cause them. The plant diseases in which we currently work are: (1) apical necrosis of mango by *Pseudomonas syringae* and (2) olive knot by *Pseudomonas savastanoi*, as models of bacterial diseases, considering different aspects of control, virulence factors, toxins, plasmids, host specificity and pathogenesis. And (3) mango malformation by *Fusarium* spp. (4) avocado root rot by *Rosellinia necatrix*, and (5) cucumber powdery mildew by *Podosphaera fusca*, as fungal disease models, considering different aspects about etiology, populations diversity, fungicide resistance, biological control and multitrophic interactions. These objectives are being addressed by different methodological approaches ranging from conventional methods in Plant Pathology to genomic approaches, as genome and plasmid sequencing, transcriptome analysis or functional genomics. For the proper development of these objectives in the short-medium term would be desirable to correct the following problems: - Staff: The group has certain shortcomings in our staff, particularly who can lead lines related to the biology and control of postharvest pathogens and diseases, basically subtropical fruits (Científico Titular). Also in 2012-2014 have finished their PhD 12 students in the group, so it is necessary to incorporate new research PhD students, among others by the program JAE-Pre. The group also has a JAE-Doc, but ending in November 2013, and the group staff exacerbate their lack of postdoctoral staff with experience, so it is critical

to reincorporate new postdoctoral staff, particularly by the JAE-Doc Programme, currently seven PhD formed in the group are doing postdoctoral stays in various international laboratories. Finally it is important for the group include technical support personnel. - Equipment: We consider it is very important to have in the coming years, at least in the new building IHSM, a laboratory with biosafety level 2, that permits work with quarantine pathogens . It is also key to equip the building with visitable plant growth chambers , and some of them also with biosafety level 2. It would also require a confocal microscope. - Space: The group space needs are evident, current space is limited and rather spoiled, but these needs should focus on the construction of the new building IHSM , where the group can access to new laboratory spaces; expanding currently available and facilities specializing in basis of the micro-organisms (fungi-bacteria, pathogen-BCA). - It is also essential to have staff for administration and management of research projects.

Fruticultura Subtropical y Mediterránea

Especialización

A4. Ciencias Agrarias

A4.1 Agrobiotecnología y mejora vegetal

LS - LIFE SCIENCES

LS2 Genetics, Genomics, Bioinformatics and Systems Biology

4. Biotechnology

4.1. Boosting cutting-edge biotechnologies as future innovation drivers

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.2. Sustainable and competitive agri-food sector for a safe and healthy diet

Investigadores Principales

HORMAZA URROZ, JOSE IGNACIO

Objetivos

Nuestra situación en la única zona europea productora comercialmente de frutas subtropicales hace que este grupo se encuentre en una posición privilegiada para liderar avances científicos en estas especies a nivel internacional. El objetivo principal es la utilización sostenible de los recursos genéticos en fruticultura subtropical tanto en condiciones actuales como teniendo en cuenta las previsiones de cambio climático. Para ello se combinan aproximaciones básicas y aplicadas en torno a 6 objetivos concretos: 1. Estudio, conservación y utilización de recursos genéticos mediante la utilización de herramientas morfológicas y moleculares. Para ello se parte de unas colecciones de germoplasma únicas a nivel internacional que permiten llevar a cabo estudios de diversidad genética en los lugares de origen de estas especies gracias a las numerosas colaboraciones internacionales del grupo. 2. Implicaciones de la biología reproductiva en producción. Para ello se combinan herramientas moleculares, microscopía y trabajo en campo. Además de la optimización de la producción, esta línea tiene una proyección básica a nivel evolutivo gracias a la situación de dos de las especies con las que se trabaja (aguacate y chirimoyo) entre las angiospermas más primitivas. 3. Desarrollo de nuevas técnicas culturales para mejora de la productividad y calidad. Este objetivo tiene un componente claramente aplicado que permite un contacto directo con el sector productor tanto en España como en otros países. 4. Selección de material vegetal de frutales subtropicales para su utilización en programas de mejora. El desarrollo de este objetivo permite el desarrollo de nuevas variedades y portainjertos de calidad de estas especies con una mayor adaptación a nuestras condiciones edafoclimáticas. 5. Cultivo de tejidos vegetales in vitro y transformación genética. Además del componente aplicado para la propagación vegetativa y el desarrollo de nuevos cultivares, esta aproximación permite llevar a cabo estudios de genómica funcional mediante el análisis de patrones de expresión genética en plantas transformadas. 6. Ingeniería de redes tróficas. El desarrollo de este objetivo permite desarrollar herramientas sostenibles para luchar contra nuevas plagas de frutales subtropicales así como optimizar la gestión de los insectos polinizadores. Además de esta proyección aplicada los resultados tienen claras implicaciones para estudios básicos en ecología y para la modelización de estrategias para paliar los efectos del cambio climático. **PROBLEMAS Y DIFICULTADES PERSONAL** El principal limitante es la baja masa crítica del grupo fundamentada en la no existencia de nuevas plazas o contratos estables para fijar investigadores ya formados que podrían dar un impulso adicional a las actividades del grupo. En el año 2013 se jubila uno de los técnicos del grupo y a lo largo de los próximos 5 años, 2 de los 6 investigadores de plantilla. Con estas perspectivas se pone en riesgo la competitividad del grupo a nivel internacional, en campos en los que actualmente es un grupo de referencia. En concreto se require: - 1 plaza de técnico medio - 3 plazas de investigadores. **Perfiles:** Poscosecha, biología reproductiva, genómica y proteómica **EQUIPAMIENTO** En los próximos años se necesitarían: - 1 invernadero para OMG y 1 invernadero para cultivo de frutales subtropicales - Fitotrones para OMG y ensayos de cambio climático - Cámaras cultivo in vitro - Un microscopio con sistema de análisis de imagen **FINANCIACIÓN** El principal limitante es la inseguridad económica tanto por la desaparición de los remanentes del grupo como por la falta de convocatorias de proyectos públicos lo que va a limitar la capacidad competitiva del grupo a corto/medio plazo

Our physical situation in the only area of Europe that commercially produces subtropical fruits results in a privileged position to lead scientific advances in these species at the international level. The main objective of this research line is a sustainable utilization of genetic resources to optimize production in subtropical fruit

tree species both under the current environmental conditions as well as taking into account climate change predictions combining basic and applied approaches along the following specific objectives: 1. Study, characterization, conservation and utilization of germplasm through the use of morphological and molecular tools. We have unique germplasm collections that are used to perform studies of genetic diversity in the areas of origin of these crops thanks to the numerous international collaborations of the group. 2. Implications of reproductive biology in yield in subtropical fruits. In order to perform this objective, molecular, microscopy and fieldwork are combined. Besides the implications to optimize production, this objective has an additional impact for basic studies of evolutionary biology thanks to the situation of two of those species (avocado and cherimoya) among the early-divergent angiosperms. 3. Development of new cultural techniques to improve productivity and quality. This objective has a clearly applied component that allows a direct relationship with the productive sector both in Spain and elsewhere. 4. Selection of plant material for its use in breeding programs. The development of this objective allows the development of new varieties with a higher adaptation to our edaphoclimatic conditions. 5. Tissue culture and genetic transformation. Besides the applied implications for vegetative propagation and development of new cultivars, this approach allows performing studies of functional genomics through the analysis of expression patterns in genetically transformed plants. 6. Food web engineering. This approach aims at contributing to the development of sustainable pest control methods, as well as at optimizing the management of insect pollinators, both while considering future scenarios of climate change. Besides the applied branch of the research, these results will have implications from a more basic ecology point of view, as they will contribute to the understanding onto how climate change will impact communities, and on what strategies to apply to minimize it.

MAIN PROBLEMS PERSONNEL The main limiting factor is the low critical mass of the group that probably will not improve in the future since no new positions or long term contracts are available for new scientists who could provide new impulse to the activities of the group. In 2013 one highly qualified technician will retire and during the following 5 years two of the 6 staff scientists will also retire. With these perspectives the current high competitive advantage of the group at the international level will be highly jeopardized. . At least the following positions should be filled in the next years: - 1 technician - 3 scientists: postharvest, reproductive biology and genomics and proteomics.

EQUIPMENT The following equipment will be required in the next years: - 1 greenhouse for GMOs and 1 greenhouse for optimization of subtropical fruit cultivation in controlled environments. - Growth chambers for GMOs and climate change experiments. - In vitro growth chambers - A new microscope with an image analysis system

BUDGET The main limiting factor is the current economic instability, both due to the lost of the economic remnants and for the lack of public new calls for grants. This will highly limit the competitive capacity of the group at the short/medium term.

Interacciones Planta-Patógeno

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS2 Genetics, Genomics, Bioinformatics and Systems Biology

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

BEUZÓN LÓPEZ, CARMEN ROSARIO

Objetivos

El objetivo principal es la identificación de estrategias de control de enfermedades de cultivos hortícolas intensivos, de alto valor económico, mediante el conocimiento de las interacciones moleculares entre la planta, el patógeno (virus, bacterias y hongos) y sus vectores. Dichas estrategias deben ser duraderas, estables, y compatibles con una producción integrada de bajo impacto ambiental y para la salud.

1. Estudio de las interacciones planta-patógeno a nivel poblacional.

1.1 Análisis de los fenómenos de adaptación al huésped en virus transmitidos por mosca blanca (begomovirus y crinivirus): impacto de la mutación y la recombinación.

1.2. Análisis de la influencia del hospedador y del insecto vector en la estructura y evolución de poblaciones de begomovirus: selección, cuellos de botella y genes de resistencia.

1.3. Estudio del papel de las polimerasas de transcripción en la variabilidad genética de begomovirus.

1.4. Análisis de las interacciones sinérgicas entre virus: impacto en patogenicidad y emergencia en begomovirus y crinivirus.

1.5. Variabilidad genética y estructura poblacional de *Verticillium dahliae* en cultivos hortícolas y frutales subtropicales.

2. Mecanismos genéticos y moleculares implicados en el establecimiento de resistencia frente a la enfermedad

2.1. Análisis del interactoma planta-patógeno en virus y bacterias: Identificación y caracterización de factores implicados en el desarrollo de la infección y el establecimiento de resistencia en los patosistemas planta-begomovirus y planta-*Pseudomonas*.

2.2. Análisis molecular y genético de los mecanismos de patogenicidad en virus (Begomovirus, Crinivirus), bacterias (*Pseudomonas*) y hongos (*Verticillium dahliae*).

2.4. Estudio del papel del silenciamiento génico en infecciones causadas por virus transmitidos por mosca blanca (Begomovirus, Crinivirus) y bacterias (*Pseudomonas*).

2.5. Análisis de los mecanismos moleculares que controlan el dimorfismo en el hongo *Verticillium dahliae*: importancia del proceso en la colonización del hospedador usando en el modelo de tomate.

3. Estudio de las interacciones

entre la planta y los virus con los vectores de transmisión. 3.1. Estudios de polimorfismo en poblaciones de mosca blanca 3.2. Análisis del interactoma virus-insecto. Identificación de interacciones implicadas en la transmisión del virus. 3.3. Análisis de interacción planta-insecto. Obtención o generación de resistencias a la mosca blanca *Bemisia tabaci*. Otros objetivos son: i) transferencia de conocimiento mediante colaboraciones con empresas del sector (ej. productoras de semillas) mediante convenios y contratos de investigación y de apoyo tecnológico; ii) formación mediante la participación en tres grados, un programa de máster y uno de doctorado de la UMA, de contribuciones puntuales con programas similares de otras Universidades; iii) divulgación de la ciencia, a través de artículos de divulgación; i) fomentar las colaboraciones establecidas con laboratorios de Italia, Francia, Reino Unido, Israel, Brasil y EEUU, así como extender las colaboraciones a grupos internacionales con énfasis en el fortalecimiento de las relaciones con América Latina, que se espera se formalicen en proyectos bilaterales e incluyan intercambios de investigadores y estudiantes. Para abordar estos objetivos y resolver los problemas previstos para los próximos tres años el grupo requiere: PERSONAL - Personal administrativo para el nuevo edificio - Cubrir la plaza de uno de los dos técnicos que se jubila dentro de tres años - Dos científicos: especialista en biología celular y ecología de relaciones multitróficas EQUIPAMIENTO - Invernadero de confinamiento para GMO y patógenos - Un microscopio confocal PRESUPUESTO Limitación de presupuesto público

The main aim of the research line is the identification of strategies to control disease in horticulture crops of economic importance, through the understanding of the molecular interactions taking place between the plant host, the pathogen, and the transmitting vectors. We aim to develop robust and durable strategies, compatible with integrated production systems with a low impact both for the environment and human health. 1. Population studies on plant-pathogen interactions. 1.1 Analysis of adaptation to the host in white fly-transmitted viruses (begomovirus and crinivirus): role for mutation and recombination. 1.2. Analysis of the influence of host and insect vector on the structure and evolution of populations of begomoviruses: selection, bottlenecks and resistance genes. 1.3. Study of the role of translesion polymerases on genetic variability of begomoviruses. 1.4. Analysis of synergistic interactions between viruses: impact on pathogenicity and emergence on begomovirus and crinivirus. 1.5. Genetic variability and population structure of *Verticillium dahliae* in horticulture subtropical crops. 2. Genetic and molecular mechanisms of plant defences against pathogens: mechanisms of resistance against disease. 2.1. Analysis of the plant-pathogen interactome in viruses and bacteria: identification and characterization of factors involved in disease development and resistance within the plant-begomovirus and plant-*Pseudomonas* pathosystems. 2.2. Genetic and molecular analysis of virulence mechanisms in virus (Begomovirus, Crinivirus), bacteria (*Pseudomonas*) and fungi (*Verticillium dahliae*). 2.4. Analysis of the role of gene silencing during infections caused by whitefly-transmitted viruses (Begomovirus, Crinivirus) and bacteria (*Pseudomonas*). 2.5. Molecular mechanisms controlling dimorphisms in *Verticillium dahliae*: relevance for host colonization in tomato. 3. Interactions between the plant and the different viruses with the transmission vectors. 3.1. Polymorphism in whitefly populations. 3.2. Analysis of the virus-vector interactome: Identificación de interacciones implicadas en la transmisión del virus. 3.3. Plant-insect interaction: Generation of resistance against the whitefly *Bemisia tabaci*. Other aims are: i) transfer of knowledge through collaborations with related companies (eg. seed producers) through research or technological support contracts and agreements; ii) formative efforts through lecturing within three University degrees, a masters degree and a doctorate programme from UMA, and contributions to similar programs from other Universities; iii) bringing science closer to society through popular science articles; i) strengthen current collaborations with laboratories from Italy, France, UK, Israel, Brasil and USA, as well as extend it to other international groups with emphasis on strengthening relationships with Latin America, hopefully involving the signature of bilateral agreements including exchange of scientists and students. For all this, the group needs to solve some problems/ needs that will arise in the short-medium term: PERSONNEL - Administrative personnel to support the new building - Replacing one of the two technical assistant positions associated to the group when the person currently occupying it retires in three years - 2 scientists: cellular biology and insect-plant-pathogen ecology EQUIPMENT The following equipment will be required in the next years: - Greenhouse and growth chambers for GMOs and cultivation in controlled environments. - A laser confocal microscope BUDGET The main limiting factor is the current economic instability, both due to the loss of the economic remnants and for the lack of public new calls for grants.

Mejora de calidad y seguridad agroalimentaria de los frutos

Especialización

A4. Ciencias Agrarias

A4.1 Agrobiotecnología y mejora vegetal

LS - LIFE SCIENCES

LS2 Genetics, Genomics, Bioinformatics and Systems Biology

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.2. Sustainable and competitive agri-food sector for a safe and healthy diet

Investigadores Principales

Objetivos

1. Identificación de genes implicados en la acumulación de sólidos solubles, ácidos orgánicos, vitamina C, alérgenos, flavonoides y antocianinas mediante análisis de QTL e identificación de determinantes genéticos, en tomate y fresa. 2. Bases estructurales y moleculares de la formación de la cutícula y sus componentes en frutos de tomate, con especial énfasis en las primeras etapas de desarrollo y maduración del fruto. 3. Determinación de las relaciones existentes entre las características biomecánicas e hidrodinámicas de la epidermis y cutícula del fruto y el agrietado y microagrietado del fruto de tomate. 4. Interacción entre los caracteres de calidad (acumulación de sólidos soluble, ácidos orgánicos, vitamina C, flavonoides, antocianinas y agrietado) y las condiciones ambientales que pueden ser modificadas mediante prácticas culturales (humedad relativa, iluminación, temperatura y calidad y aporte del agua). 5. Papel de las hormonas auxina, etileno y giberelinas y sus rutas de señalización en el desarrollo de los frutos en fresa. 6. Identificación de QTL y componentes genéticos implicados en la resistencia a *Tetranychus*, y *Bemisia* en tomate y en la resistencia a *Bemisia*, virus transmitidos por insectos (CYSDV y WMV) y oidio en melón. 7. Mecanismos de resistencia a *Bemisia* en tomate y a *Bemisia* y oidio en melón. 8. Identificación de nuevas fuentes de resistencia a virus transmitidos por insectos (TYLCV y ToCV), y a sequía en tomate, mediante aprovechamiento de la variabilidad natural. 9. Identificación de parámetros fisiológicos en raíz y parte aérea relacionados con el uso eficiente del agua en tomate. 10. Identificación de componentes moleculares y mecanismos implicados en la integridad de la membrana plasmática y estudio de la señalización de esteroides en la tolerancia a sequía. 11. Estudios de genes reguladores del proceso de maduración de los frutos de fresa. El grupo necesita cubrir algunas necesidades a corto y medio plazo, como son, en general, contar con un sistema estable y fiable de financiación de la investigación y, como necesidad particular, financiación para el mantenimiento de los bancos de germoplasma que son una necesidad estructural del grupo. Con respecto a instalaciones y equipamiento, es muy importante que se mantengan las instalaciones de cultivos de plantas (invernaderos) existentes, sobre todo en la Estación Experimental La Mayora, pero también en el campus de la Universidad de Málaga, aunque también será necesario a plazo medio construir nuevos invernaderos que reemplacen a otros con los que se cuenta, ya antiguos, y prácticamente obsoletos; será también necesario contar con laboratorios modernos como los que se crearán cuando se termine la construcción del nuevo edificio del IHSM, y adquirir equipos para análisis metabolómico de plantas y frutos, la renovación de equipos para biología molecular/marcadores moleculares o de ecofisiología de plantas, en muchos casos obsoletos o sobreutilizados. Respecto al personal, necesitamos nuevos científicos de plantilla para seguir creciendo o, al menos, compensar la pérdida de investigadores prominentes del grupo (uno ya jubilado y al menos otro próximo a la jubilación). Es imprescindible que, cuanto menos, se mantenga el número de personal de apoyo, especialmente el del personal técnico auxiliar que mantiene los cultivos en los invernaderos y muy conveniente que se dote de nuevo personal administrativo general cuando se disponga del nuevo edificio del Instituto.

1. Identification of genetic elements involved on the accumulation of soluble solids, organic acids, vitamin C, allergens, flavonoids, and anthocyanins through QTL analysis and identification of genetic determinants in strawberry and tomato. 2. Molecular and structural bases of cuticle formation and its components in tomato fruits with special emphasis to first stages of fruit development and ripening. 3. Relationship between biomechanical and hydrodynamic characteristics of fruit epidermis and cuticle with cracking and micro-cracking in tomato fruits. 4. Interaction of quality traits (accumulation of soluble solids, organic acids, vitamin C, flavonoids, anthocyanins, and cracking) with the environmental conditions that can be modulated by cultural practices (relative humidity, light conditions, temperature and quality and water input). 5. Role of the hormones auxin, ethylene, and gibberellins and their signal transduction pathways in the development of strawberry fruits. 6. Identification of QTL and genetic components involved in the resistance to *Tetranychus* and *Bemisia* in tomato, and in the resistance to powdery mildew, *Bemisia* and insect-transmitted virus in melon (CYSDV and WMV) 7. Resistance mechanisms to *Bemisia* in both species. 8. Identification of new genetic resistance sources to insect-transmitted viruses (TYLCV and ToCV), and to drought stress, taking advantage of natural variation in tomato. 9. Identification of physiological parameters in root and shoot related with water use efficiency of tomato grown under greenhouse. 10. Role of plasma membrane repair and sterol signalling in drought stress tolerance. 11. Genes regulating ripeness process in strawberry. The group needs to cover some needs for the short-medium terms such as, in general, stable and reliable general research funding sources, or focussed funding for specific issues like the maintenance of germplasm resources that are a structural need for the group. Regarding equipment and facilities, it is crucial to maintain the greenhouses available in La Mayora Experimental Station and Universidad de Málaga campus but also to construct new ones to renovate several obsolete greenhouses, to have access to modern laboratories through the construction of the new IHSM building, to acquire equipment for plant and fruit metabolite content analyses and for renovation of old and over-used ecophysiological and molecular marker equipments. Regarding personnel necessities, we need to recruit new staff research members as one prominent member of the group has just retired and another one is close to retirement. It is completely necessary, at least, to maintain numbers for the auxiliary personnel working in the greenhouses, and new general administrative personnel to support the new IHSM building.

