Ferdowsi University
of Mashhad

پژوهشکده علوم گیاهی
دانشگاه فردوسی مشهد

Research Center for Plant Sciences
(RCPS)

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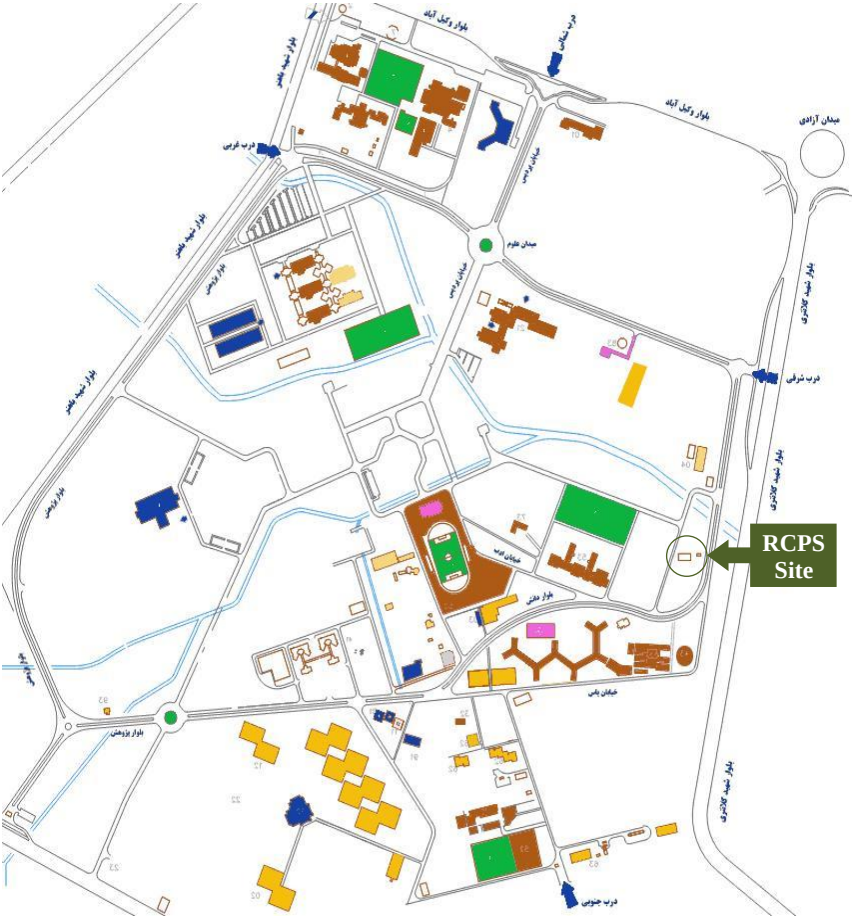
2018

بسم الله الرحمن الرحیم

The Location of RCPS on
Ferdowsi University of Mashhad Campus



History and Introduction

Herbarium of the Ferdowsi University of Mashhad (FUMH) was established in 1981, with the aim of studying the flora of Khorassan. In 1991, it was upgraded to a Botany Research Department after a decade of activity. In 2000, due to the research objectives of the University, the plan of developing the department into a Research Center for Plant Sciences was approved and the Research Center preceded its activities as an independent unit with three research departments namely Botany, Legumes and Ornamental Plants. Eventually, the establishment of a Research Center for Plant Sciences was approved in February 2005.

The Deans of the Research Center for Plant Sciences

Name	Academic Position
M. Zokaei	Instructor (1981-1982)
Dr. M.H. Rashed Mohassel	Assistant Professor (1983-1998)
A. Nezami	Instructor (1999-2002)
A. Ganjeali	Instructor (2003-2005)
Dr. M.H. Rashed Mohassel	Professor (2005-2007)
Dr. M. Farsi	Associate Professor- Professor (2007-2013)
Dr. A. Nezami	Professor (2013-2017)
Dr. E. Izadi Darbandi	Associate Professor (2017-to date)

This Center has a close collaboration on research and training with several institutes and organizations such as Ministry of Agriculture, Department of Environment, Iran Meteorological Organization, Science and Technology Parks, Faculties of Sciences, Agriculture, Environment and Natural Resources of FUM, Medical University of Mashhad, Islamic Azad University, Tehran University, Tarbiat Moallem and Payame Noor Universities, University of Applied Science and Technology, Iranian Academic Center for Education, Culture and Research (Jehad Daneshgahi), Ministry of Education and some other private companies.

Departments

The Research Center for Plant Sciences consists of three departments: Botany, Legumes, and Ornamental Plants.

Department Name	Approval Date	Head of the Department (Current)
Botany	1992	Dr. H. Moazzeni, Assistant Professor
Legumes	2001	Dr. J. Nabati, Assistant Professor
Ornamental Plants	2001	Dr. L. Samie, Assistant Professor

Botany Department

Khorassan provinces cover a surface area of 313,000 Km^2 which is almost one-fifth area of the country with diverse types of climates, habitats, and vegetation. Out of 8000 plant species of Iran, 2600 species are native to Khorassan. The enormous number of species grown in the region requires a constant and laborious effort in order to investigate the variation of species. The results of these investigations will advantage determination of present species, description of new taxa and the threatened flora. During the past 37 years, over 65,000 specimens have been collected by the Botany department that constitute a permanent and well-documented record of plant distribution mainly in North, South and Razavi Khorassan provinces. These efforts have resulted in recording several plant species that are new to the flora of Khorassan, Iran and even new to the science. Collection and recognition of plants according to the international standards, and sorting them in the Herbarium had been one of the outstanding achievements of botany department which has had great importance in basic and applied botany.

According to the well-known specialists and botanists of the country, Herbarium of FUM is one of the richest herbaria in Iran which is ranked as the second after the herbaria located in Tehran. Registration of FUMH in the *Index Herbariorum* has increased its world popularity and resulted in research collaboration with the national and international research centers.

The Herbarium FUMH supports the botanical research in the Department, the RCPS, the University, the Khorassan provinces, the country and also in the international collaborations. The unique and diverse contributions of FUMH herbarium to the classical plant taxonomic studies as well as modern biological research with emphasis on unique botanical collections and their digitized data are the base of a mid- to long-term research program approved by the University Research Council for the Department of Botany.

Objectives of the Botany Department

1. Identification of plant biodiversity in Khorassan:

- **Collecting, determining and archiving the vascular flora in the herbarium**
- **Taxonomic studies on plant families based on herbarium specimens**
- **Plant biosystematic studies with special reference to the flora of Khorassan**
- **Preparing volumes of the Flora of Khorassan**
- **Ecological studies on the vegetation types in Khorassan**
- **Classification of plant communities in Khorassan based on phytosociological methods**
- **Phytogeographical analysis of Khorassan**
- **Collection and identification of non-vascular flora of Khorassan**

2. Conservation assessment of plant biodiversity in Khorassan:

- **Identifying important plant areas and biodiversity hotspots**
- **Monitoring populations of the endemic and sub-endemic plants**
- **Prioritizing conservation of the threatened plants based on IUCN red list categories and criteria**
- **Foundation of the botanic garden and seed banking of the native plants**

3. Application of the different aspects of the plant biodiversity in Khorassan:

- **Ethnobotanical studies in Khorassan**
- **An analysis of the diversity and application of the crop wild relatives in the natural flora of Khorassan**
- **Diversity and ecology of invasive and alien plants in natural and urban flora**
- **Applied palynological studies**
- **Assessing the resistance abilities of the native plants to biotic and abiotic stresses**

Scientific Members of Botany Department

Name	Academic Position
Dr. H. Moazzeni	Academic staff, Assistant Professor (Head)
Dr. F. Memariani	Academic staff, Assistant Professor
M.R. Joharchi	Academic Staff, Instructor
Dr. H. Ejtehadi	Academic Staff (part-time), Professor
Dr. M.H. Rashed Mohassel	Academic Staff (part-time), Professor
Dr. J. Vaezi	Academic Staff (part-time), Associate Professor
Dr. A. Pirani	Academic Staff (part-time), Assistant Professor
H.R. Sharghi	MSc., Research Expert
Y. Naseh	MSc., Research Expert

Legumes Department

Legumes grow all over the world and have been adapted to various environmental and geographical conditions. These crops have a great nutritional value and comprise one of the richest sources of plant proteins. Legumes are the second source of human food after the cereals. Forage legumes such as alfalfa play an important role in feeding the domestic animals, and consequently, providing the animal proteins. Due to their symbiotic relationship with nitrogen-fixing bacteria, they act as soil biofertilizers in improving the physical and chemical properties of the soil.

The number of varieties available for the legumes including chickpea, lentil, pea, and field bean are very limited in the country. For instance, during last 20 years, only a few varieties of chickpea have been released. According to the planting background of these crops and their adaptation to Khorassan climates, a comprehensive and long-term research plan is needed to fulfill the goals. Therefore, department of legumes has been developed with a special focus on pulses. Several projects are being done on cold, drought, and diseases resistance in various areas of agronomy, ecophysiology and biotechnology.

Objectives of the Legumes Department

- Investigation of agronomic, echo-physiological and genetic characteristics of legumes in order to improve and sustain the yield
- Investigation of different aspects of nitrogen fixation by legumes
- Applying biotechnological methods to improve the quantitative and qualitative traits in legumes
- Studying the effect of biotic and abiotic stresses on the yield and production of legumes, and breeding for stress tolerance varieties
- Cooperation with other research and executive organizations in order to introduce proper legume varieties, adapted to the environmental conditions of the region
- Collaboration with other scientific centers such as Faculties of Sciences and Agriculture to train the postgraduate students

Scientific Members of Legumes Department

Name	Academic position
Dr. J. Nabati	Academic staff, Assistant Professor (Head)
Dr. S. Vessal	Academic staff, Assistant Professor
Dr. F. Shokoohifar	Academic staff, Assistant Professor
Dr. A. Bagheri	Academic staff (part time), Professor
Dr. M. Kafi	Academic staff (part time), Professor
Dr. A. Nezami	Academic staff (part time), Professor
Dr. A. Ganjeali	Academic staff (part time), Associate Professor
Dr. M. Parsa	Academic staff (part time), Associate Professor
Dr. S. Malekzadeh	Academic staff (part time), Associate Professor
Dr. E. Izadi	Academic staff (part time), Associate Professor
Dr. N. Moshtaghi	Academic staff (part time), Associate Professor
Dr. S.S. Hojjat	MSc., Research Expert
H. Porsa	MSc., Research Expert
H. Mirshahi	MSc., Research Expert

Ornamental Plants Department

There is a great potential for production of various types of ornamental plants in the country due to the wide climate diversity, low costs of energy resources as well as inexpensive skilled labors. Furthermore, a valuable and unique genetic source of flowers in our country has created a great capacity for mass production of flowers and then, a facility for participation in the world markets. Definitely, recognizing the capacities, efficient management and focus on scientific researches will result in continuous production and international marketing of ornamental plants, successfully.

Having a desired ecological variation and good potentials for ornamental plants production, the great Khorassan province will be able to play an important role in flower export.

Objectives of the Ornamental Plants Department

- **Plant domestication, adaptation and introduction of new ornamental plant species through taking advantage of huge genetic resources, available in the country**
- **Establishment of micpropropagation protocols for mass production of modern and native ornamental plant cultivars and species**
- **Establishment of live collections of potential native ornamental germplasms for further breeding activities**
- **Investigation on plant quality improvement in ornamental plants**
- **Improvement and optimization of ornamental plants production methods**
- **Taking advantage of biotechnology methods in ornamental plants improvement**
- **Growth and climate modeling of plants in urban landscape**
- **Introduction and production of low maintenance ornamental species for use in dry and semi-dry area**
- **Evaluation of native plant tolerance to biotic and abiotic stresses**

Scientific Members of Ornamental Plants Department

Name	Academic position
Dr. L. Samiei	Academic staff, Assistant Professor (Head)
Dr. Z. Karimian	Academic staff, Assistant Professor
Dr. A. Tehranifar	Academic staff (part time), Professor
Dr. M. Shoor	Academic staff (part time), Associate Professor
Dr. H. Nemati	Academic staff (part time), Assistant Professor

Activities

Botany Department

According to its specific objectives, botany department has carried out some fundamental and comprehensive studies. Up till now, more than 30 research projects have been accomplished and some others are under study by the department researchers. Some projects are listed as bellow:

- **Collection, classification and determination of plant specimens in Khorassan provinces (1982-1991)**
- **Foundation of FUM botanic garden (Study phase, 2002-2004)**
- **Collection and identification of lichens of Khorassan province (2004-2006)**
- **Identification and collection of plant specimens in Tandooreh National Park (2004-2006)**
- **Identification and collection of plant specimens in Naybandan Wildlife Refuge (2004-2006)**
- **Flora and vegetation ecology of Fereizi region (2005-2007)**
- **A floristic study of northern slopes of Aladagh mountains in north Khorassan province (2007-2009)**
- **Flora of Ferdowsi University of Mashhad Campus (2007-2008)**
- **Botanical study of the medicinal plants in Iran (2008-2010)**
- **A taxonomic study of *Dianthus polylepis* complex (Caryophyllaceae) in NE Iran using molecular methods (2013-2014)**
- **Systematics of the genus *Erysimum* (Brassicaceae) in Iran (2015-2017)**
- **Taxonomy of the genus *Iris* (Iridaceae) in Khorassan (2015-2017)**
- **Caryology of *Berberis integerrima* populations in Khorassan (in progress)**
- **A taxonomic revision of the grasses (Poaceae) in Iran (in progress)**
- **Diversity, distribution patterns and conservation assessment of *Dianthus* species in Iran (in progress)**

The department publications consists of five books and more than 130 scientific papers in national and international journals.

The academic staffs of this department have also had a very active participation in scientific conferences both inside and outside the country.

One of the inter-organization agreements of this department with Northern Khorassan province in recent years has been “The identification of flora of the province with a special emphasis on application aspects and conservation of the plant genetic resources”.

One of the outstanding achievements of this department is 590 new species records for Khorassan province, 90 new records for the flora of Iran and 54 new taxa to the science which have been reported in botanical journals.

Legumes Department

Due to the important role of legumes (especially pulses) in providing the protein needs of the country, the department of legumes has established near 20 research projects in different scientific and practical aspects of the legumes.

The main objective of these projects has been to find a way to overcome the production difficulties such as biotic and abiotic stresses in cultivation regions of the country.

Some of these projects are as follow:

- **Evaluation of cold resistance in chickpea in order to fall and winter sowing in highland areas (2003-2005)**
- **Root growth of chickpea genotypes in response to drought stress: physiological and morphological aspects (2003-2004)**
- **In vitro selection of freezing tolerance cell lines of chickpea (*Cicer arietinum* L.)**
- **Evaluation of chickpea germplasms for six pathotypes of Ascochyta blight resistance in Iran (2002-2004)**
- **Evaluation of cold tolerance in chickpeas under field condition in order to the identification of cold tolerate germplasms (2004-2006)**
- **Evaluation of chickpea (*Cicer arietinum* L.) germplasm for drought resistance (2006-2007)**
- **Evaluation of lentil germplasms for cold tolerance in order to fall sowing in high regions**
- **Optimal exploitation of fallow lands with an emphasis on farming legumes**

This department has so far published 42 books and 500 papers in national and international scientific journals, in which 115 have been written in English.

Some other research activities performed by this department are as follows: Directing of over 95 MSc and PhD theses, Establishing of the pulses seed bank with over 1000 chickpea and 500 lentil seed samples, Performing the First National Pulse Crops Symposium in Iran, Foundation of the Iranian Pulse Crops Association (in process), and active participation of the academic staffs in several scientific conferences within and beyond the country.

Ornamental Plants Department

In order to achieve its goals, the Ornamental Plants Department has implemented various basic and applied research projects. Some of the current and terminated research projects are as follows:

- **Establishment of comprehensive urban landscape projects of Mashhad and Golbahar city**
- **Preparation of Mashhad Park database**
- **Evaluation of genetic diversity of *Tulipa* and *Allium* species of Khorassan province using ISSR**
- **Development of micropropagation protocol for endangered species *Clutea gifanna* and releasing the adopted plantlet to its own habitat**
- **Development of micropropagation protocol for *Ungernia, Diaphanoptera* and *Dionysia tapetodes***
- **Establishment of the live collection of *Allium* species of Khorassan**
- **Identification of *Eremurus* species of Iran and evaluation of their genetic diversity**
- **Establishment of micropropagation protocol for some native Rose species of Iran**
- **Establishment of micropropagation protocol for indoor plants including Impatiens and Begonias**
- **Determination the salt and drought tolerance in some ornamental plants including *Nitraria schuberi, Salvia splendense* and *Calendula officinalis***
- **Introduction of suitable native plants in Khorasan provinces based on climate modeling studies**
- **Determination of the landscape design preferences at Ferdowsi University Campus from users' perspective**
- **Simulation the amount of sustainable establishment of some grasses in arid and semi-arid regions**

Publication of four books and over 100 papers in scientific journals, supervising postgraduate research theses and dissertations and participation in national and international scientific conferences are amongst the activities of members of this Department. Moreover Iranian Society of Ornamental Plants

(ISOP)- Branch Khorassan has been established by members of ornamental plants department. Scientific and administrative cooperation in the holding the First International and 2nd National Ornamental Plants Congress (Mashhad, 2016) and the International Symposium on Wild Flowers and National Ornamental Plants (Ramsar, Iran, 2017) were among other activities of this Department.

Facilities

Research Center for Plant Sciences of Ferdowsi University of Mashhad has been placed in a two-floor building with the area of 1300 square meters. Some of the properties and facilities available in the Center are:

Herbarium

Herbarium of Ferdowsi University of Mashhad (FUMH) is a unique plant collection with over 65,000 plant specimens collected from Khorassan provinces and the neighboring areas. The collected specimens are categorized into 146 families, 864 genera, and more than 2600 species, according to the scientific principles, 590 out of which are new to Khorassan provinces, and 90 and 54 species are new for Iran and the world, respectively.

Laboratory of Plant Biosystematics

The old laboratory of botany has been upgraded to the Plant Biosystematics Lab in order to improve the botanical research in the research center. This laboratory is equipped with three microscopes, 10 stereo-microscopes, one microtome and different botanical training charts.

Laboratory of Stress Physiology

The Laboratory of Stress Physiology has been designed with the aim of performing practical researches in different aspects of plant physiology and studying the influence of different biotic and abiotic stresses on plant growth. In this lab, environmental stresses such as drought, salinity, cold, heat and light, as well as biological stresses are simulated; and then, stress effects, critical periods of stresses occurrence and plant responses to them are studied. It is expecting that through these researches, plant traits responsible for resistance or susceptibility, will be determined and used for genetic improvement of the commercial varieties.

The laboratory is equipped with several tools including: Chemical Fume Hood, Laborota, Chlorophyll Meter, Germinator, Oven, Precise Lab Scale, Root Washer Machine, Plant Water Potential Measurer (Arimad), Chlorophyll Fluorescence, Leaf Area Meter, Leaf Area and Root Analyzer, Canopy Analysis

System (SunScan), Seed Counter, Tensiometer, Ohmmeter, Sampler, Refrigerator, Nitrogen Tank, Vacuum Pump, Computer and many kinds of lab chemicals and glass wares.

Biotechnology and Plant Tissue Culture Laboratory

According to the special importance of biotechnology in fundamental plant studies and with the aim of performing basic researches in other related fields, this laboratory was established and equipped in 2000. Now, research studies are possible on various fields of plant tissue culture, PCR based molecular markers, protein assessment technology and different types of electrophoresis. The equipments are as below:

Fermentor, Double Water Distiller, Oven, Tissue Culture Room, Growth Chamber, Sterile Laminar Air Flow, Autoclave, Stirrer, Electrophoresis, Water Bath, Biophotometer, pH Meter, Nitrogen Tank, Digital Lab Scale, Thermocycler (PCR), Gel Documentation, Micro Centrifuge, Micro Spine, Refrigerated Centrifuge, Orbital Shaker, Freezer (-20°C and -80°C), Refrigerator (+4°C), Conduct Meter, Microwave, Mixer, Homogenizer, chemicals and

materials needed for kinds of plant tissue culture and molecular examinations (RAPD, PCR, RFLP molecular markers and …).

Seed Bank

Pulses Seed Bank of FUM as a valuable seed collection, started its activities in 1995. This seed bank with a refrigerator room by a temperature of below the zero °C conserves seed samples. About 1,000 Chickpea and 500 Lentil seed samples are preserved in the bank, which some of them have been collected from different parts of the world.

There are also several seed bank guidance booklets and Excel computer files that support the information and characterizations of the seed samples. This research unit has provided seeds for more than 250 thesis, dissertations and research projects from Ferdowsi University and other universities and research centers of the country.

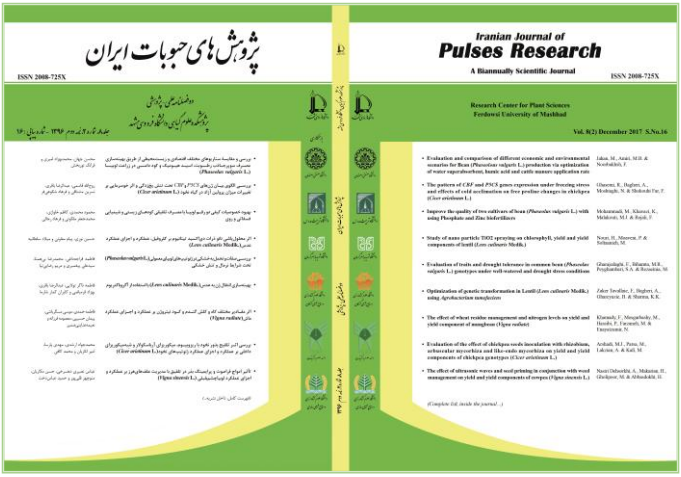
Scientific Journal Unit

Iranian Journal of Pulses Research

This journal publishes the results of research on pulses in a variety of scientific fields. The important pulses crops include chickpea, lentil, beans, cowpea, mung bean, peas and grass pea. This journal has the “Scholarly Grade” issued by the Ministry of Sciences, Research & Technology and is published based on a Memorandum of Cooperation between Mashhad Ferdowsi University and the following universities: Isfahan University of Technology; Tarbiat Modares University; University of Shahid Bahonar Kerman; Gorgan University of Agricultural Sciences and Natural Resources; Shiraz Branch, Islamic Azad University; Sari Agricultural Sciences and Natural Resources University.

This journal is indexed in: (ISC) Islamic World Science Citation Center; (magiran) Iranian Journals Database; (SID) Scientific Information Database; and Google Scholar.

The journal is published in two numbers per year (biannually). IJPR as the first and only pulses scientific journal in the country, publishes the results of research on pulses in various research fields. The process of submitting an article and tracking its status is done through the dedicated database of IJPR site in the integrated management system of the scientific journals of Ferdowsi University of Mashhad at https://ijpr.um.ac.ir/index.php. Also, a complete list of published articles, with full access to papers is available and visible on the same URL.



Research Farm

Considering the necessity of having an appropriate research field for conducting various research activities, a 9,000 square meters land in the vicinity of the Center Site has been allocated in order to construct a research farm. The proximity of this farm to the workplace of the researchers provides a good opportunity for the necessary monitoring of projects. The processes of preparation are performed including: leveling, installing fence, preparation and installation of water reservoirs and irrigation facilities, fertilizer distribution and land preparation operations. Now, the research farm has been largely ready for exploitation and so far several projects have been implemented.

Research Greenhouse

Due to the necessity of carrying out research on plants growth under controlled conditions and also during off-season, the issue of constructing a research greenhouse was considered seriously. So, the initial studies began in 2011 on location and type of construction. For this purpose, the patterns of greenhouse structures in the Khorasan region and similar structures in other countries of the world, were studied and finally, the glasshouse was designed with a combination of iron structure and aluminum retaining frames with a total area of 140 square meters in the form of four separate units of 28 square meters in 2014.

The Greenhouse has located in the northern side of RCPS, in the vicinity of the building. This greenhouse is currently in operation.

Botanic Garden

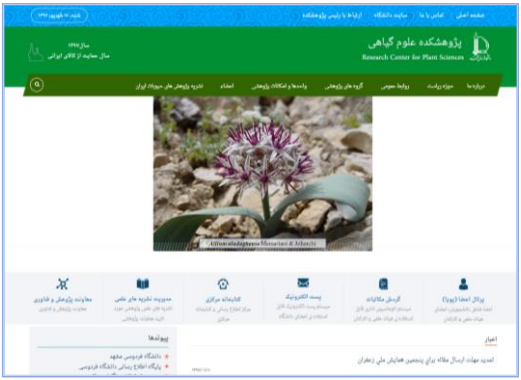
One of the most significant activities performed by the Center has been the proposal of the foundation of a botanical garden offered in 2001. Due to the importance of plant genetic conservation in the country, and according to the other applications of the botanic gardens in different fields of the research including training, tourism, and economy, this proposal has been provided. The botanic garden will be constructed in a 4.3 hectares land in the southwestern side of FUM campus.

Computer and Network Unit

The Computer and Network Unit provides hardware and software services and supports the relevant equipment and applications. Faculty members, experts, staffs, students and researchers use this services. This unit is also responsible for communicating with the Information & Communication Center (CIC) of the university.

Internet Website

The Internet website of the Research Center for Plant Sciences (http://rcps.um.ac.ir) was opened in 2004. Since 2004, the site has been redesigned and optimized, twice with upgrading software and up-to-date structures and information. The features of this site are: creating a different and efficient appearance by arranging and organizing with easy and fast access paths; Integrated and systematic supply of complete information about the RCPS and its activities; and introducing and providing useful links.



Conference Hall

A conference hall with the capacity of 60 seats has been constructed and equipped in 2005.

Ferdowsi University
of Mashhad

Research Center for Plant Sciences

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