



Web-based networking of herbal gardens for exchange of planting material



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ABSTRACT

In recent years the demand for medicinal and aromatic plants has grown rapidly at national and international level because of its vital role in supply nutrients as well as strengthen human's various VITAL systems to protect from innumerable diseases. The collection, conservation and exchange of planting material of medicinal plants are some of the major problems in this sector. Taking these things into consideration, a web based network of Herbal Garden in India (HGI) has been designed and developed at Directorate of Medicinal and Aromatic Plants Research (DMAPR), Anand, Gujarat, India. HGI is a web based decision making system and provides information about the herbal gardens in India and facilitates the exchange of planting material. HGI has been developed using Tomcat6, Struts 2.0, JavaScript & MySQL and hosted at <http://www.herbalgardenindia.org>. System has been designed using modular approach and has separate modules for garden curators (nodal officers) and general users. Nodal officers have the right to insert, edit/update and delete data related to their respective gardens. General users have the flexibility to access the information about the herbal gardens of India and the system facilitate to approach nearby garden for the required planting material.

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1. Introduction

Medicinal and aromatic plants sector is now becoming popular and gradually gaining importance Worldwide because of the change in the mindset of the people regarding safety and having lower side effects of herbal drugs than synthetic drugs. The demand for medicinal and aromatic plants has grown rapidly at international level because of its vital role in supply nutrients as well as strengthens human's various VITAL systems to protect from innumerable diseases. India has a rich heritage and long history of using medicinal and aromatic plants in improving the quality of life. India is also fortunate to have the richest reservoir of traditional herbal medicinal plants and prescriptions. India's plant bio-diversity is one of the richest in the world and contains nearly 8000 plant species present on the earth, many of which have not been fully explored and cultivated. As per the estimates of the WHO about 80% of the world's population depends on herbal medicine for their primary health care. Some of the deadly and painful diseases such as cancer, HIV, AIDS, and rheumatic arthritis look promising remedy from herbal source.

Plants and plant-based products have been used traditionally by the inhabitants of India from the time immemorial. However commercial utilization including cultivation is a new phenomenon in medicinal plants. The present era witnessed a renaissance and rejuvenation in the traditional system of medicine. The annual export of India's herbal sector is about \$147 Million (<http://www.dgciskol.nic.in/>). The domestic market of Indian Systems of Medicine and Homeopathy (ISM&H) is of the order \$730 Million, with a total consumption of all botanicals to a figure of 177,000 MT, which is expanded day by day (<http://www.nistads.res.in/indiasnt2008/t4industry/t4ind19.htm>). Organized cultivation is practiced only in about 70 medicinal plants and superior performing varieties are lacking in majority of the cultivated medicinal plants. The growing demand for natural product based medicines, health products, etc. in the national and international markets is causing indiscriminate harvest from the wild. In the Indian commercial market, nearly 90–95% of the medicinal plants in trade are obtained from the wild. It is estimated that over 70% of the plant collection involve destructive method. High consumption of this wild flora mostly due to the destructive collection method (collection of root, bark or the entire plant) caused a great challenge to the survival of this invaluable wealth in nature. Moreover, raw drug collection from the wild cannot guarantee the quality.

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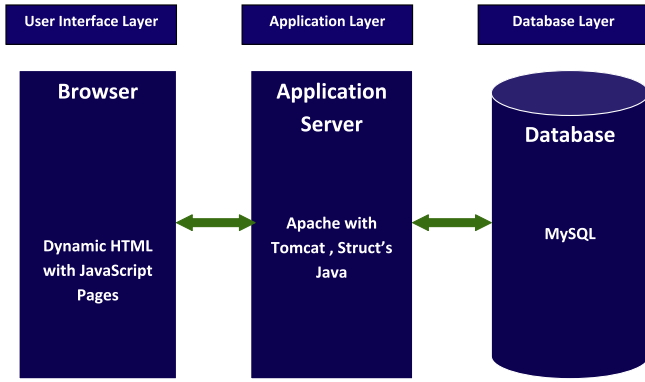


Fig. 1. HGI system design architecture.

Cultivation of medicinal plants and creation of herbal gardens/ botanical gardens act as efficient *ex situ* conservation strategies and have thus become the top priorities in the agenda of commercialization. Accordingly, a large number of herbal gardens are established across the country by various funding agencies where a large number of medicinal plant species are maintained. Seed and planting material are the most important input for the success of development of horticulture which includes fruits, vegetables, flowers, spices, tuber crops, plantation crops and medicinal and aromatic plants (Singh, 2010). Availability of the right species and quality planting material are two major components of Good Agricultural Practices (GAP). Understanding the importance of medicinal plants planting material, an attempt was made to develop a web based information system on Herbal Gardens in India (HGI) for information of planting material as there is no system available for sharing the information.

2. Materials and methods

2.1. System architecture

HGI has been implemented in a three layered structure i.e. User Interface Layer (UIL), Application Layer (APL) and Database Layer (DBL). UIL is implemented using JavaScript (Flanagan, 2006). It consists of forms for accessing herbal gardens information, accepting information from the user and validate those forms using JavaScript. APL has been implemented using Apache with Tomcat6 (Moodie and Mittal, 2007) as application server, Struts' 2.0 (Donald et al., 2008; Srikanth and Nithin, 2005) as application framework for building web based application. DBL has been implemented using MySQL (DuBois, 2007; Dyer, 2008). MySQL is a powerful open access relational database for creating data warehouses. The relational approach has been used to design the database. The fundamentals of normalization theory have been used to normalize different tables of the database. All tables have proper interaction among themselves via primary key–foreign key relationship. The normalization has been done up to the 3NF level on the database. The HGI system architecture is shown in Fig. 1.

2.2. Database design

Data on herbal gardens were collected from individual herbal gardens maintained by various government and non-government organizations in India with the help of National Medicinal Plant Board (NMPB) and different state forest departments. Herbal gardens willing to join the network and to share the information were requested to provide the classified information such as species name, common name, number of plants available in each species, and planting material availability, and also the name of funding

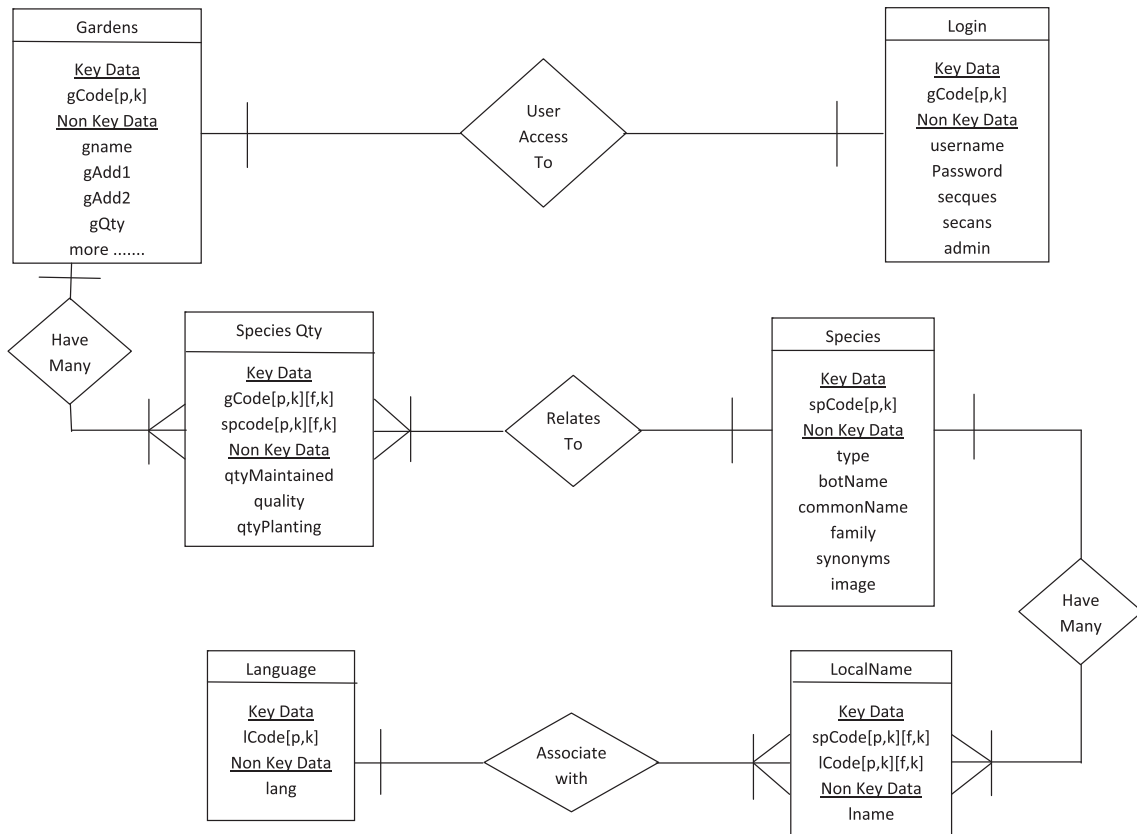


Fig. 2. ER diagram of the database.

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