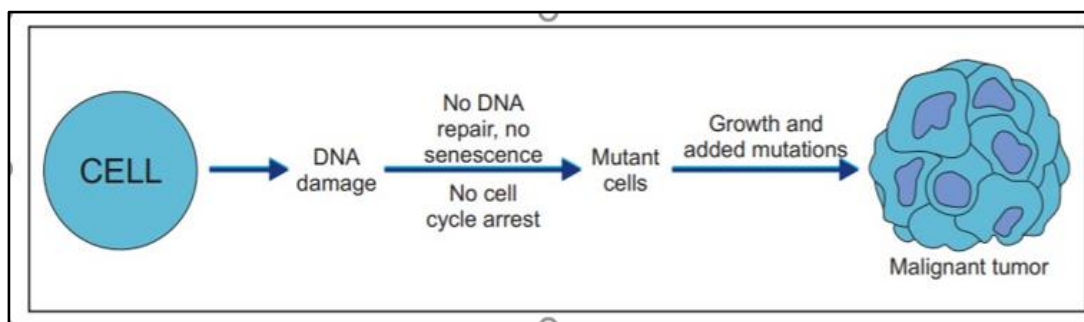


Cancer remains to be one of the leading causes of death around the world. The discovery of modern drug and surgical-targeted therapies has undeniably improved cancer patients' cares. Despite decades of basic and clinical research and trials of promising new therapies, it remains one of the major causes of morbidity and mortality. Hence, there is a need for a safer and more effective chemopreventive measures and treatment which is clearly needed for the improvement of the efficiency and to lower the treatment cost for cancer care. Natural plants and plant-based drugs have been used to prevent and to treat various diseases for thousands of years. This small research is based on cancer chemoprevention and treatment using the bioactive components derived from the natural plants and herbs. Relevant molecular mechanisms involved in the pharmacological effects of these phytochemicals are also being studied. All fruits, spices and vegetables be it local or exclusive have a unique benefiting quality which when put in right form and place work miraculously. Using XAMPP server as well as programming and scripting languages such as HTML, CSS, JAVA, PHP have been used to construct a working website for the database. Idea here is to make a comprehensive knowledgebase to generate awareness and not being mere bamboozled by all the advance medicine techniques as the only remedy. Apart from safeguarding our endangered cultural heritage this idea will provide a platform to young minds to embrace the knowledge and culture also paving the way to an active nodal scientific studies and researches.

The main objective of this work is to create a database-driven functional knowledgebase namely, KARAUDHI to provide information on local and rare species of herbs and plants showing anticancer activity. Providing comprehensive information about their extracts, phytochemicals showing anticancer property and pharmacodynamic potencies and activity of these compounds.

## 1.1 What is Cancer?

Cancer is an abnormal growth of cells which differentiate irrepressibly by deviating from the usual rules of the cell division. Normal cells tend to obey the signals which direct them to undergo division and differentiation into new cells or deacease. Meanwhile, cancerous cells advance to become independent from these signals and result to grow and proliferate relentlessly. Cancer disease involves several tempo-spatial deviations from normal cell division resulting in the physiology of cells to precancerous (premalignant) or cancerous (malignant) state. Hence, the major cause for the disease condition and death in cancer patients is due to the invasion of tumour cell into the surrounding tissues and distant organs (Kumar,2018).



**Figure.1** Simplified depiction of how a cell undergoes malignant change – with DNA damage, no repair and further mutations.

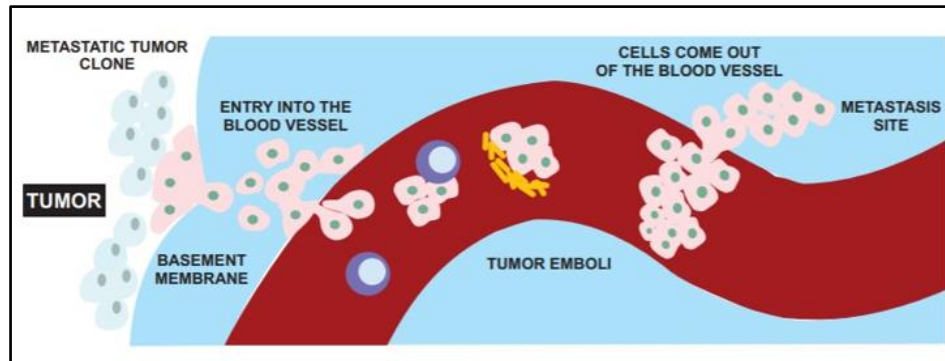
## 1.2 Properties of Cancerous cells.

Cancer cell genotypes are result of the altered cellular physiology which as a group directs the tumour malignancy. These physiological variations include:

- (i) Self-sufficiency in signals produced for cell growth,
- (ii) Insensitivity to signal molecules that inhibit cell growth,
- (iii) Evasion of apoptosis (programmed cell death) mechanism,
- (iv) Ability to multiply rapidly,
- (v) A continuous process of angiogenesis, and
- (vi) Spread to other tissues (metastasis).

Attainment of the above physiological variations or unusual composition at some point of the (<https://thehumanoperatingmanual.com/cancer-as-a-metabolic-disease>)

The cancer that has spread from the place where it first formed to another place in the body is called metastatic cancer. The process by which cancer cells spread to other parts of the body is called metastasis. Metastatic cancer has the same name and the same type of cancer cells as the original, or primary, cancer. (<https://patient.info/cancer/cancer/types-of-cancer>).

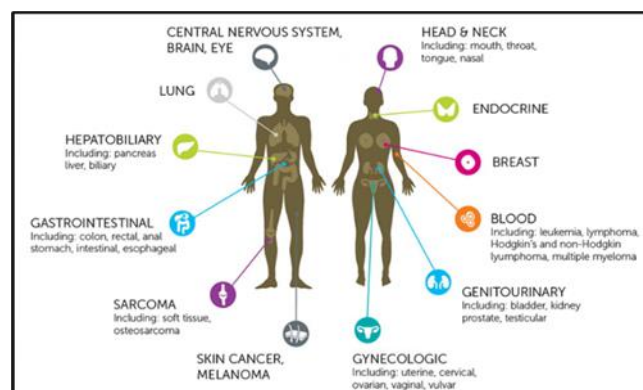


**Figure 2.** metastatic cancer

### 1.3 Types of Cancer

There are more than 100 different types of cancer happening in the body. Each type of cancer is classified by the type of cell the cancer originates from. For example, a breast cell, a lung cell, etc. Each type of cancer generally falls into one of three categories:

- Carcinomas are cancers that arise from cells which line a body surface, or the lining of a gland - for example, the skin, or the lining of the gut, mouth, neck of the womb (cervix), airways, etc.
- Sarcomas are cancers that arise from cells which make up the connective tissues such as bones or muscles. For example, an osteosarcoma is a cancer of bone tissue.
- Leukaemias and lymphomas are cancers of cells in bone marrow and lymph glands.



**Figure 3.** Types of cancer

Cancer type	Main sites of metastasis
Breast	Lungs, liver, bones
Colon	Liver, peritoneum, lungs
Kidney	Lungs, liver, bones
Lungs	Adrenal gland, liver, lungs
Melanoma	Lungs, skin/muscle, liver
Ovary	Peritoneum, liver, lungs
Pancreas	Liver, lungs, peritoneum
Prostate	Bones, lungs, liver
Rectum	Liver, lungs, adrenal gland
Stomach	Liver, peritoneum, lungs
Thyroid	Lungs, liver, bones
Uterus	Liver, lungs, peritoneum

**Figure 4.** Types and site of metastatic cancer

#### 1.4 Causes of cancer

Cancer is a complex group of diseases with many possible causes. Common ones include:

- (i) Chemical carcinogens
- (ii) Lifestyle factors (smoking, drinking etc.)
- (iii) Lack of exercise
- (iv) Unhealthy eating
- (v) Infection
- (vi) genetic makeup

Most cancers are probably due to a combination of factors. Not everybody who has contact with a potential cancer-causing substance (carcinogen) or has an unhealthy lifestyle will develop cancer.



**Figure5.** Causes of cancer

## **1.5 Problems in cancer treatment**

Surgery is the most widely used treatment methods for cancer such as chemotherapy, and radiotherapy or a combination of treatments, such as surgery and chemotherapy or surgery and radiotherapy (<https://www.cancer.gov/about-cancer/treatment/types>). Cancer surgery, which is most effective in the treatment of localized primary tumour and related lymphatic system tumours and issues. Surgery is performed for different purposes such as diagnosis, staging, primary treatment, debulking, palliation, etc.

Radiation therapy (radiotherapy) is another form of cancer treatment, which uses the high-energy rays (ionizing radiation) to kill or damage cancer cells causing tumours. The objective of radiation therapy is to kill as many cancer cells as possible without destroying the healthy tissue. The side effects of surgery include pain (often temporary), fatigue, the risk of infection at the surgical site, scarring, and numbness. (<https://www.cancer.gov/about-cancer/treatment/types/radiation-therapy>)

Chemotherapy is a systematic (whole body) treatment. It can destroy cancer cells almost anywhere in your body. However, some healthy and normal cells may also be damaged by this treatment. Surgery, when used as a sole treatment, cures more patients compared to other cancer therapies, because surgery operates through zero-order kinetics, in which 100% of cancer cells are killed, whereas radiotherapy and chemotherapy are able to destroy a portion of tumour cells by each therapy. (v. Vijaya Kumar, 2018)

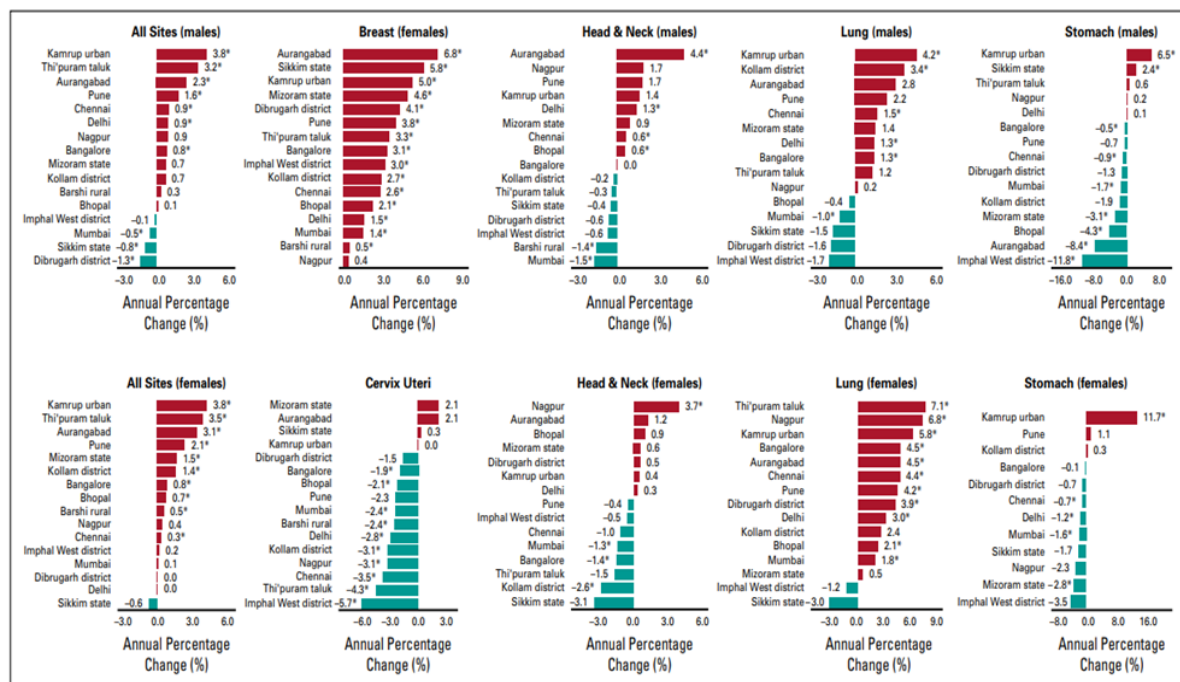
The recent cancer treatments include the hormonal therapy involving certain hormones made in the body and the targeted therapy to destroy cancer cells using the body's immune system. The possible side effects of the above therapies are risks of infection, anaemia (low red blood cells), bruising and bleeding, hair loss, tiredness (fatigue), sour mouth and ulcers, feeling sick (nausea) or being sick (vomiting), loss of appetite, taste changes, constipation, diarrhoea, skin colour changes, and hormonal changes. (<https://www.cancer.gov/about-cancer/treatment/types/hormone-therapy>).

The burden of cancer in countries like India is intimately linked to the country's major socioeconomic inequalities and in access to health care and other areas. Rebalancing of the distribution of power, social goods, and resources is a crucial determinant of it is hard for India to address its cancer burden in the long term. Failure to address social inequalities reduces survival and can needlessly increase the costs of cancer to individuals and Indian society as a whole (Prof Mohandas KMallathMD MD, 2014).

## **1.6 Statistics in India and worldwide.**

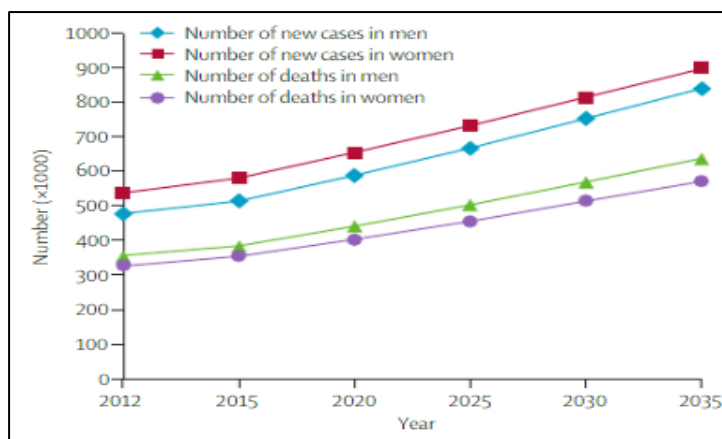
Slightly more than 1 million new cases of cancer are diagnosed every year in a population of 1.2 billion. In age-adjusted terms this represents a combined male and female incidence of about a quarter of that recorded in western Europe. However, an estimated 600 000–700 000 deaths in India were caused by cancer. The common 5 leading sites are breast, lung, mouth, cervix uteri, and tongue. Trends in Cancer incidence rate showed an increase in all sites of cancer in both sexes and were high in urban (annual percent change, 3.8%; P, .05). The majority of the patients with cancer were diagnosed at the locally advanced stage for breast (57.0%), cervix uteri (60.0%), head and neck (66.6%), and stomach (50.8%) cancer, whereas in lung cancer, distant metastasis was predominant among males (44.0%) and females (47.6%) (see figure.6)

In India, the burden of disease is still strikingly unlike that in post-industrial nations. In men, the more common cancers are tobacco-related. For Indian women, cervical cancer is the second most common incident cancer (says survey 2012) (Mohandas K Mallath, 2014).



**Figure 6:** Annual percentage change (APC) in age-adjusted incidence rates (AAR) over the time period for different types of cancer.

Given that the poorest two-thirds of the population is in much greater need of better health-care provision than is the wealthiest third, increased public investment in health services needs to be a public policy priority for India. If current trends continue then estimated increase in cancer cases will affect the whole population. Estimated project incident and mortality will be something like (figure.7).



**Figure7.** Estimated project incident and mortality rate till 2035.

### 1.7 Medicinal Plants as Anticancer Agents

Natural plants have been used to prevent and to treat various diseases for thousands of years. They are excellent sources of bioactive components exerting their health beneficial effects, and very often, these sources are materials for gourmet food consumptions (Hu Wang, 2012). Certain bioactive components from the plants have been confirmed for their anti-cancer activities. There is an estimate that approximately 50-60% of cancer patients in the USA and India that utilize agents derived from different parts of plants or nutrients (complementary and alternative medicine), exclusively or concomitantly with traditional therapeutic regimen such as chemotherapy and/or radiation therapy.

Bioactive compounds and their products are not a fast and quick cure like therapies and market available cancer drugs (figure.8) neither do they have so many side-effects. These are natural products or natural compound-based products which when included in your daily life helps impeded, delay and cure cancer. i.e., Chemoprevention.

Chemically derived epigenetic drugs have been developed and undergone trials such as 5-azacytidine (azacitidine; Vidaza) and 5-aza-2'-deoxycytidine (decitabine; Dacogen) which are both DNMTi 11 and HDACi such as suberoyanilide hydroxamic acid (SAHA, Vorinostat, Zolinza) and FK228 (Romidespin, Istodax). However, it is difficult to engineer a chemically derived drug which is non-toxic to normal cells and is specific to cytotoxicity of cancer cells. Therefore, development and research into naturally derived compounds to be used for anticancer treatment is becoming high in demand with a focus on those derived from plant species and their natural products

For plants such as *Vinca minor*, *V. major*, *Catharanthus roseus*, *Digitalis purpurea*, *Taxus baccata*, *Papaver somniferum*, *Nothapodytes nimmoniana*, and *Ophiorrhiza mungos* are used for isolating some of the anticancer compounds including vincristine, Taxol, morphine, and camptothecin.



Herbal formulations are also available for the same in market and for some medicines are still being developed.

Also, Attention is being drawn towards foods with medicinal properties, such foods include cruciferous vegetables and fruit berries. Raw by-products from industries could be utilized to extract anticancer agents from sources possess these agents. For example, one of the biggest crops grown globally are grapes (*Vitis vinifera*) and 'grape seed extract' is often added in ingredients of food products due to its human health benefits. Going all natural is the only saviour for the future.

Class	Mechanism of Action	Primary Toxicities	Representative Drugs
Alkylating agents	Bind and cross-link DNA either inter-strand, intrastrand, or to proteins; prevents replication and transcription	Hemorrhagic cystitis, alopecia, nephrotoxicity	Cyclophosphamide, ifosfamide, melphalan
Alkylating-like agents	Cross-link DNA strands (interstrand)	Nephrotoxicity, neurotoxicity, myelosuppression	Cisplatin, carboplatin
Antibiotics	Interfere with DNA replication through free radical formation and intercalation between bases	Variable	Bleomycin, actinomycin D
Antimetabolites	Block enzymes required for DNA synthesis	Gastrointestinal, myelosuppression, dermatologic, hepatotoxicity	Methotrexate, 5-fluorouracil
Plant (vinca) alkaloids	Inhibit microtubule assembly	Myelosuppression	Vincristine, vinblastine, paclitaxel
Topoisomerase inhibitors	Inhibit topoisomerase, resulting in DNA strand breaks	Myelosuppression, alopecia, gastrointestinal	Etoposide, Topotecan

**Figure 8.** some examples of chemotherapeutic drugs  
([https://www.brainkart.com/article/Chemotherapy\\_25862/](https://www.brainkart.com/article/Chemotherapy_25862/))

## 1.8 BIOINFORMATICS

Bioinformatics is the application of information technology in the field of biology. The term was coined by Pauline Hogweg in 1978 for the study of informatic process of biotic systems. Bioinformatics nowadays entails the creation and advancement of database, algorithm, computational and statistical techniques, and theory to solve formal and practical problems arising from management and analysis of biological data. Bioinformatics tools aid in comparing, analysing and interpreting genetic and genomic data and more generally in the understanding of evolutionary aspects of molecular biology.

At a more integrative level, it helps analyse and catalogue the biological pathways and networks that are an important part of systems biology. It plays a role in the text mining of biological literature and the development of biological and gene ontologies to organize and query biological data.

## **1.9 Bioinformatics and Computational biology**

Computational biology involves the development and application of data-analytical and theoretical methods, mathematical modelling and computational simulation techniques to the study of biological, ecological, behavioural, and social systems. The field is broadly defined and includes foundations in biology, applied mathematics, statistics, biochemistry, chemistry, biophysics, molecular biology, genetics, genomics, computer science, ecology, and evolution. Hence, the actual process of analysing and interpreting data is referred to as computational biology.

Important sub-disciplines within bioinformatics and computational biology include:

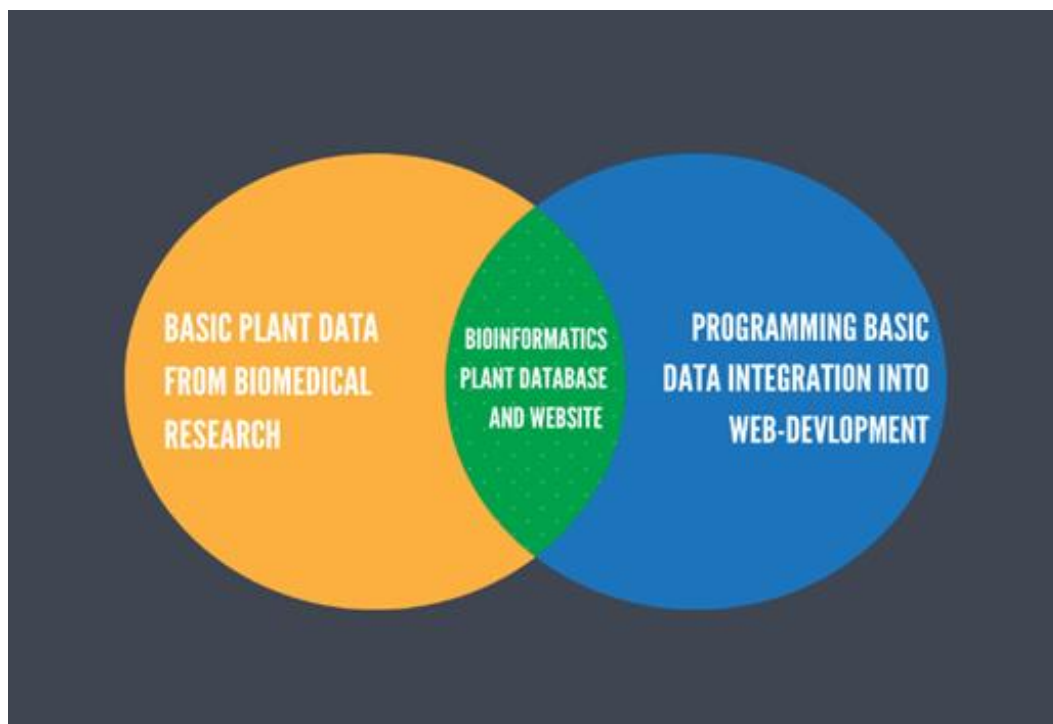
- Development and implementation of computer programs that enable efficient access to, management, and use of, various types of information.
- Development of new algorithms (mathematical formulas) and statistical measures that assess relationships among members of large data sets. For example, there are methods to locate a gene within a sequence, to predict protein structure and/or function, and to cluster protein sequences into families of related sequences.

### **1.10. Databases**

Databases are essential for bioinformatics research and applications. Many databases exist, covering various information types: for example, DNA and protein sequences, molecular structures, phenotypes and biodiversity. Databases may contain empirical data (obtained directly from experiments), predicted data (obtained from analysis), or, most commonly, both. They may be specific to a particular organism, pathway or molecule of interest. Alternatively, they can incorporate data compiled from multiple other databases. For ex. NCBI, GenBank, PubMed etc.

Biological databases are need of the hour as so voluminous data is being generated on the daily basis it is very important of properly organise and store this data. Analysing and interpreting gets easier with organised data and hence paves way to an efficient research work.

Fusion of this biologically erupting data with data integration and web development is what is actually know as bioinformatics.



**Figure 9.** Bioinformatics

#### 1.11 Idea for KARAUDHI database.

Despite presence of voluminous biomedical literature in PubMed that provides evidence for variety of naturally occurring compounds demonstrating anti-neoplastic activity, to our knowledge, few resource exists that focuses on plant-based naturally occurring compounds with anti-cancerous activity, although a few natural compound databases like SuperNatural and Herb Ingredients. Targets or cancerous compound–target repository like CancerResource have been published. Therefore, to complement these databases and to capture the intrinsic features of natural compounds that exhibit anti-tumour properties. KARAUDI (Kark rog ki Aushudhi) database is being designed and developed a central resource termed Naturally Occurring Plant-based Anti-cancer Compound database.

The data used here summarizes the latest research in cancer chemoprevention and treatment using the bioactive components from natural plants. Relevant chemical formulations involved in the pharmacological effects of these phytochemicals are discussed. Further which are wished to expand this research area not only for their scientific soundness, but also for their potential druggability.

Database also mention the traditional practise for preventing cancer from various Upanishads and tribal believes it also includes desi nuskhe associated with the particular plant. Hence it is a database for the people.

The data related to medicinal herbs and plants ranging from their botanical names to common name, uses, habitat, and traditional knowledge along with their images was obtained from different web sources including, literature, databases and news. They are arranged in plant table and profile section of database as done for other studies. In the present study to develop the desired database, genes sequences that are expressed in different species of herbs and their relevant annotations were required. Data for searched for anticancer plants from NCBI's 'PubMed' and other databases and websites and retrieved the information. More than 350 photochemical were obtained from 110 plants and herbs. Other relevant information of the data is mentioned from various research papers and literature studies. PubChem links for these phytochemicals have been mentioned in the final tables.

### **3.1 Data Collection**

The data related to medicinal herbs and plants ranging from their botanical names to common name, uses, habitat, and traditional knowledge along with their images was obtained from different web sources including, literature, databases and news. They are arranged in plant table and profile section of database as done for other studies. In the present study to develop the desired database, genes sequences that are expressed in different species of herbs and their relevant annotations were required. Data for searched for anticancer plants from NCBI's 'PubMed' and other databases and websites and retrieved the information.

### **3.2 Database Design**

In this project, special efforts were employed to get correct details for effective database development, because designing, implementing and running databases are predominantly a series of decisions taken on intricate details. Database is developed using combination of web programming languages including HTML, JavaScript, tailwind CSS, PHP, MYSQL. Shows the database structure and working strategy.

### **3.3 XAMPP server**

XAMPP stands for Cross-Platform (X), Apache (A), MySQL (M), PHP (P) and Perl. It is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server possible. XAMPP's ease of deployment means a WAMP or LAMP stack can be installed quickly and simply on an operating system by a developer, with the advantage that common add-in applications such as WordPress and Joomla can also be installed with similar ease using Bitnami.

#### **3.3.1 Other components of XAMPP**

Cross-Platform: Different local systems have different configurations of operating systems installed in the server. The component of cross-platform has been included to increase the utility and audience for this package of Apache distributions. It supports various platforms such as packages of Windows, Linux, and MAC OS.

Apache: It is an HTTP a cross-platform web server. It is used worldwide for delivering web content. The server application has made free for installation and used for the community of developers under the aegis of Apache Software Foundation. The remote server of Apache delivers the requested files, images, and other documents to the user.

MariaDB: Originally, MySQL DBMS was a part of XAMPP, but now it has been replaced. It is one of the most widely used relational DBMS, developed by MySQL. It offers online services of data storage, manipulation, retrieval, arrangement, and deletion.

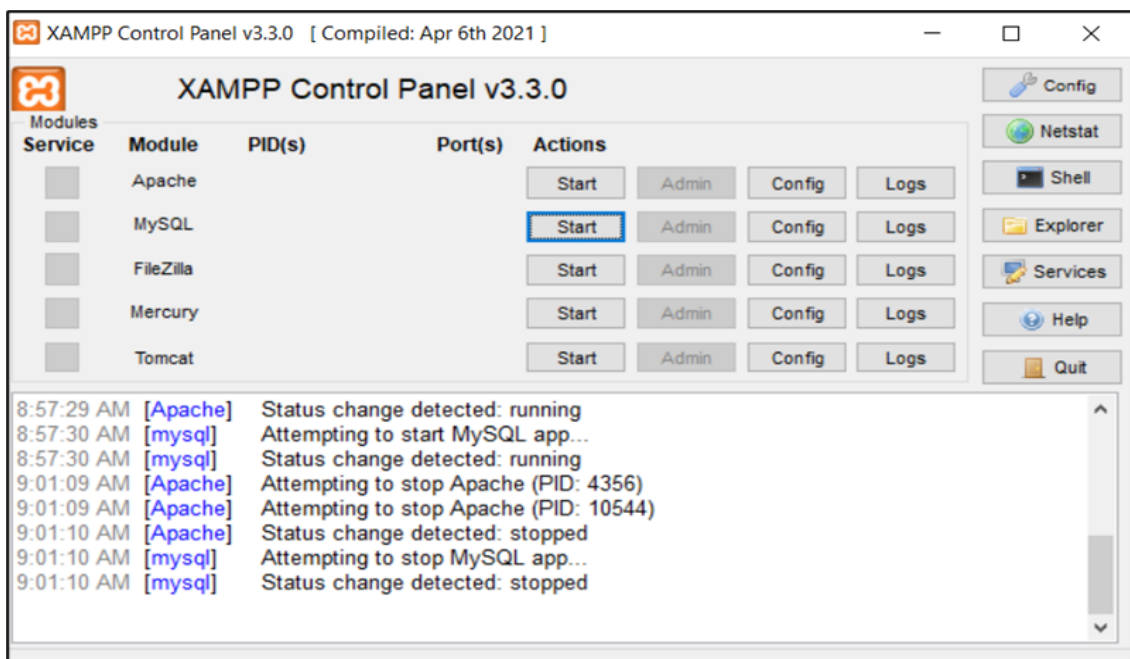
PHP: It is the backend scripting language primarily used for web development. PHP allows users to create dynamic websites and applications. It can be installed on every platform and supports a variety of database management systems. It was implemented using C language. PHP stands for Hypertext Processor. It is said to be derived from Personal Home Page tools, which explains its simplicity and functionality.

Perl: It is a combination of two high-level dynamic languages, namely Perl 5 and Perl 6. Perl can be applied for finding solutions for problems based on system administration, web development, and networking. Perl allows its users to program dynamic web applications. It is very flexible and robust.

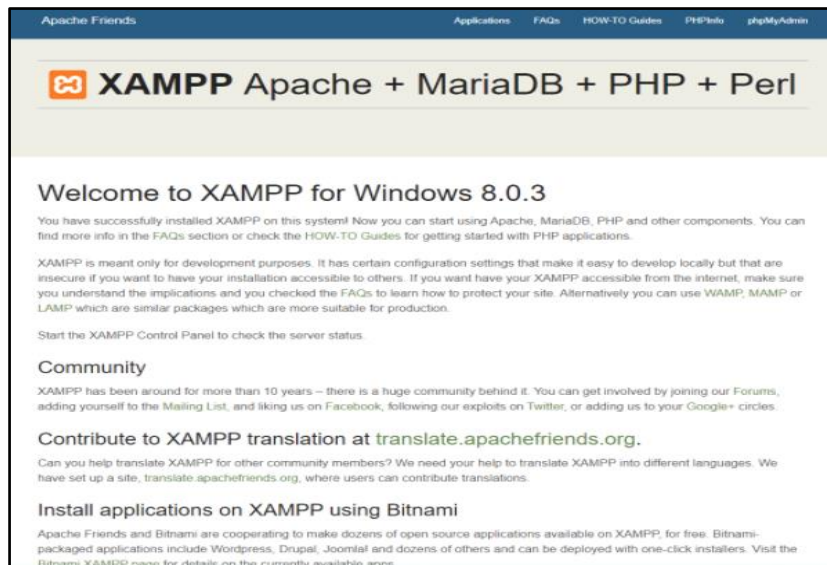
phpMyAdmin: It is a tool used for dealing with MariaDB. Its version 4.0.4 is currently being used in XAMPP. Administration of DBMS is its main role. Database for developed using this tool.

OpenSSL: It is the open-source implementation of the Secure Socket Layer Protocol and Transport Layer Protocol. Presently version 0.9.8 is a part of XAMPP.

XAMPP Control Panel: It is a panel that helps to operate and regulate upon other components of the ports and plugins languages. APACHE and MySQL were used in this project.

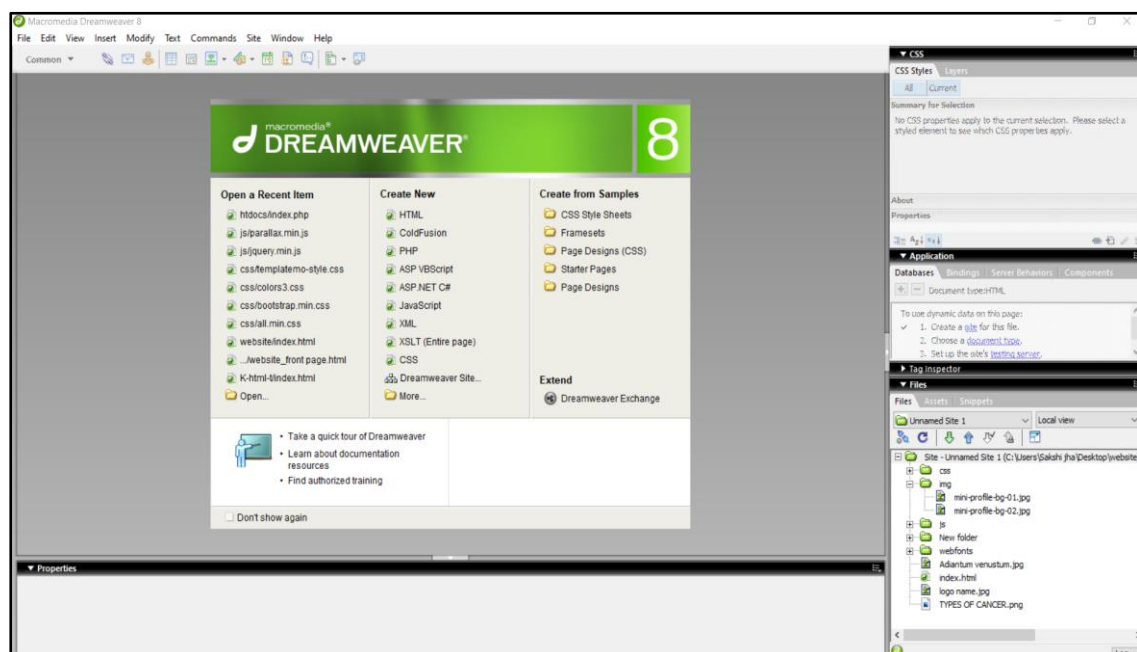


**Figure 10.** XAMPP control panel



**Figure 11.** XAMPP homepage

### 3.4 Macromedia Dreamweaver 8



**Figure 12.** Dreamweaver software

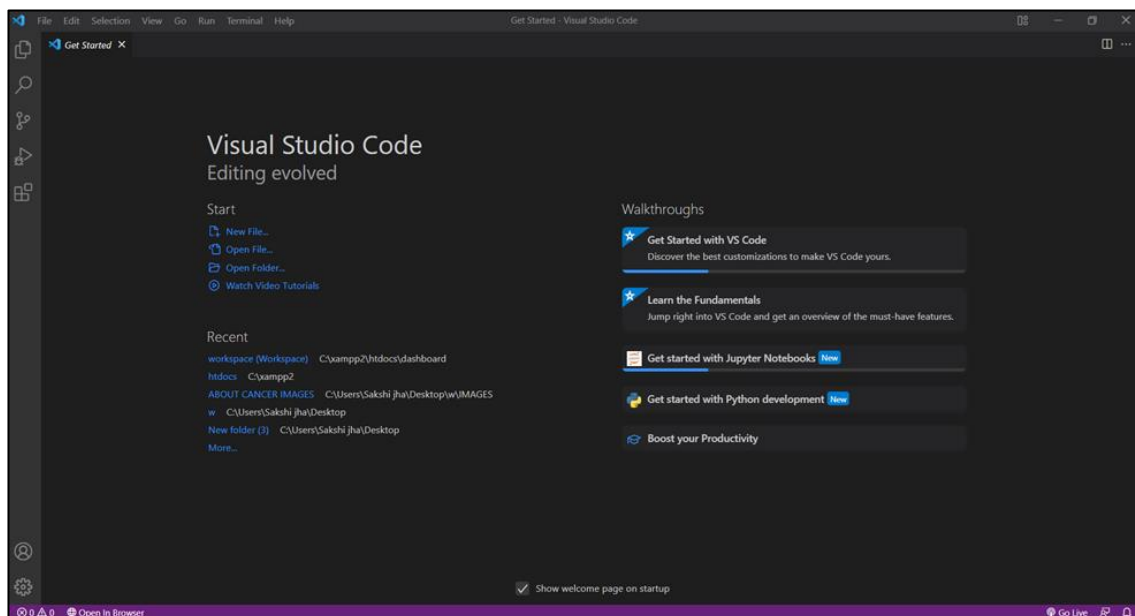
Macromedia Dreamweaver 8 from Adobe is the industry-leading web development tool that lets you efficiently design, develop and maintain standards-based websites pages and applications. Dreamweaver 8 provides a powerful combination of visual layout tools, application development features, and code editing support which supports web development due to live output view. User can develop websites and pages via graphic design or coding. (<https://www.adobe.com/support/documentation/en/dreamweaver/dw8/releasenotes.html>).

Dreamweaver 8 includes a variety of media to help you learn the application and become proficient with creating web graphics. The Dreamweaver help system includes documentation to help you use Dreamweaver and develop Dreamweaver extensions. You can also consult additional online resources on the “Dreamweaver Documentation Resource Centre”. This software had been used to design webpages coding purposes.

### 3.5 Visual Studio Code

Visual Studio Code is a free coding editor that helps you start coding quickly. Use it to code in any programming language, without switching editors. Visual Studio Code has support for many languages, including Python, Java, C++, JavaScript etc. VS code helps gives you suggestions to complete lines of code and quick fixes for common mistakes. You can also use the debugger in VS Code to step through each line of code and understand what is happening and code accordingly.

SSH, or the secure shell protocol, lets you access a remote computer or virtual machine securely over a network connection. You can connect over SSH into another machine from Visual Studio Code and interact with files and folders anywhere on that remote filesystem. If you have an app located on a different computer, you could use SSH to connect to it and access your app, view its files, and even modify, run, and debug it. You can also take advantage of any tools or dependencies installed on that remote machine. You could connect to remote machines very different than your local machine. For instance, they could have a different operating system, different tools installed, or much stronger computing power.

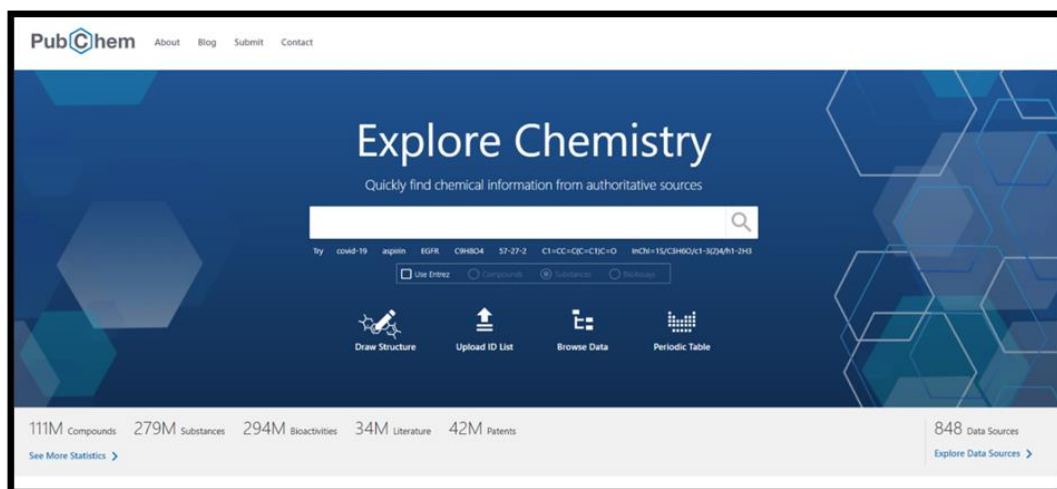


**Figure 13.** VS CODE homepage



### 3.6 Other websites and databases used:

#### 3.6.1 PubChem



**Figure 14.** PubChem Homepage - <https://pubchem.ncbi.nlm.nih.gov/>

PubChem is an open chemistry database at the National Institutes of Health (NIH). Since the launch in 2004, PubChem has become a key chemical information resource for scientists, students, and the general public. Each month our website and programmatic services provide data to several million users worldwide. Since the launch in 2004, PubChem has become a key chemical information resource for scientists, students, and the general public. Each month our website and programmatic services provide data to several million users worldwide.

All the phytochemicals obtained post literature study that are responsible for showing anticancer activity was searched in PubChem. It has unique identifier for each compound (CID), Substance (SID), Bioassay (AID) which helps in uniquely identifying all the compounds.

Most of the bioactive compounds obtained post literature study have PubChem profiles from where information regarding chemical structure, pharmacodynamic and pharmacokinetic data can be obtained with working efficacy of the drugs. Since PubChem is cross referenced, it provides links to various other biological and chemical databases full information can be retrieved from these databases.

#### 3.6.2. PHI: Portal for Health Informatics

PHI is a web portal that maintains wide range of databases, servers and software developed in the field of bioinformatics, chemoinformatics, immunoinformatics, clinical bioinformatics, health informatics, genomics, etc.

The main purpose of this web portal is to provide help to biologist working in the field of vaccine development, drug designing, etc. The server's help biologist's in identifying potential vaccine candidate's and hence save time and money. Overall aim of the web portal is to provide scientific computation and resources required in the healthcare sector.

This server is cross-linked to more than 100 databases and websites related to cancer 'omics' hence this is a great resource package for cancer research.

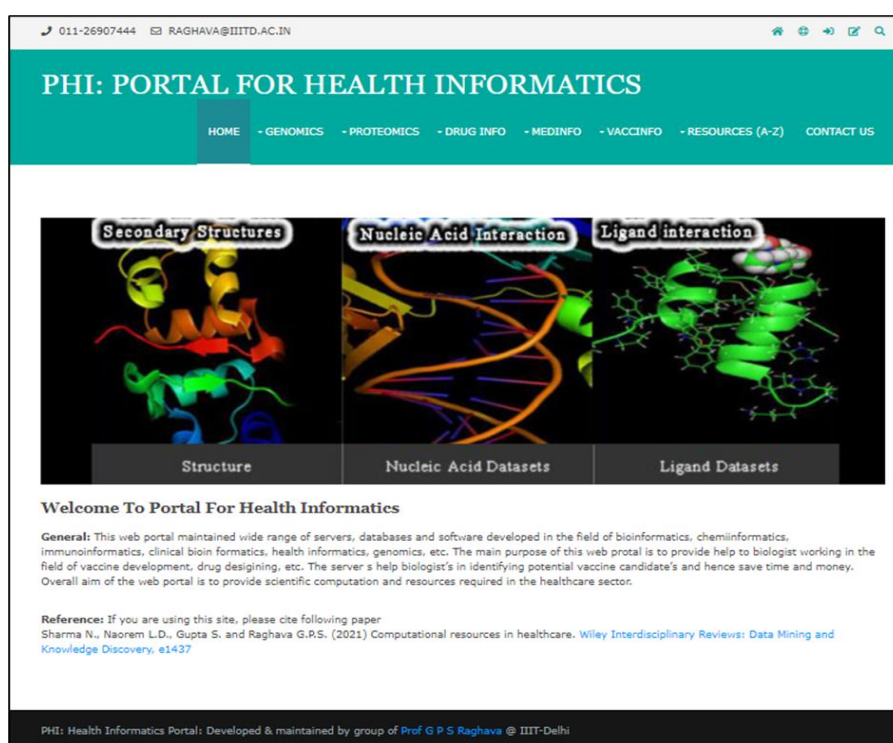
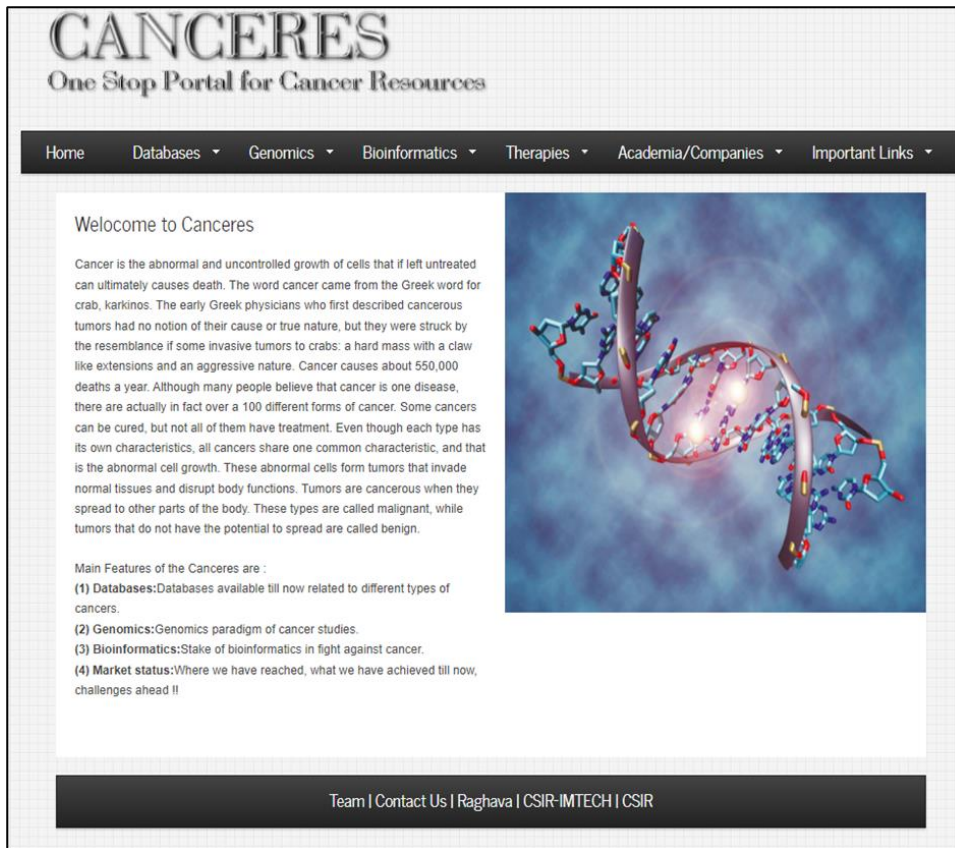


Figure15. PHI Homepage, <https://webs.iiitd.edu.in/reso.html>

### 3.6.3. CANCERES: One Stop Portal for Cancer Resources

CANCERES is a database for cancer omics it provides comprehensive data about all the cancer databases available till now related to different types of cancers. The genomics and bioinformatics aspects of cancer are also available in the database. Also, currently available drugs in market related to cancer and other upcoming drugs.

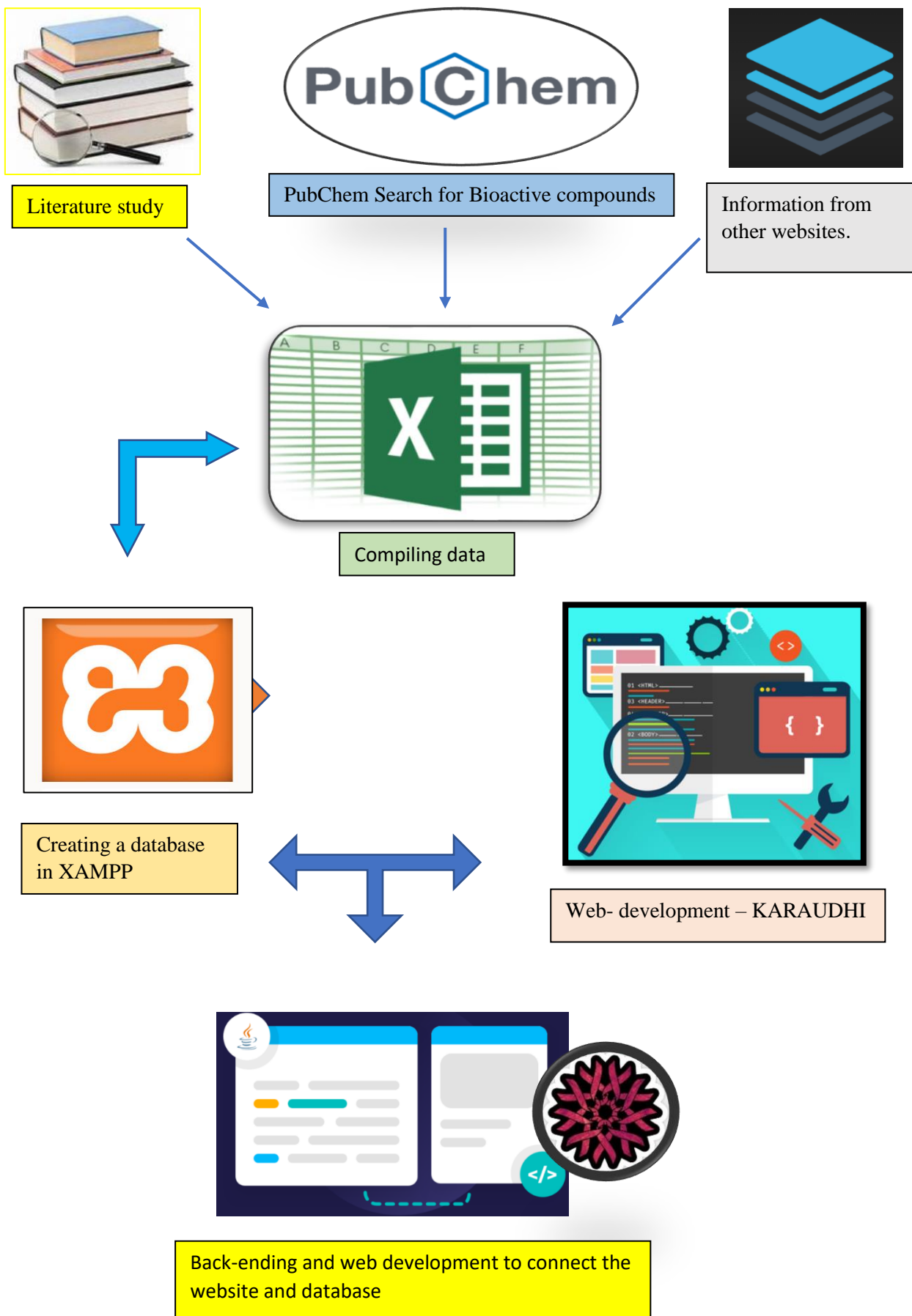
Data related to market available cancer medicines, their site of action and side effects that are mentioned in database were obtained from CANCERES.



**Figure16.** CANCERES homepage,  
<https://webs.iiitd.edu.in/raghava/canceres/index.html>

### 3.7. Web-Development tool used

- **Front-end development:** It is the part of the website a user or customer interacts with; A lot goes into making the front-end work, including database architecture, frameworks, scaling solutions etc. languages such as HTML-CSS were used for website building. Tailwind-CSS was used for the framework of the database, JavaScript was used for responsiveness of the website.
- **Back-end development:** It refers to any part of a website or software program that users do not see.in this project it involved the connection of website with the Karaudhi database inside the XAMPP server. This was done using languages such as PHP for connection, JavaScript for uniformity in code and proper display of data from the database to the website.
- **Connectivity :** For DBMS of the database and connection to to the website MySQL has been used along with PHP connectivity scripts.



## 4. Results

### 4.1 DATABASE

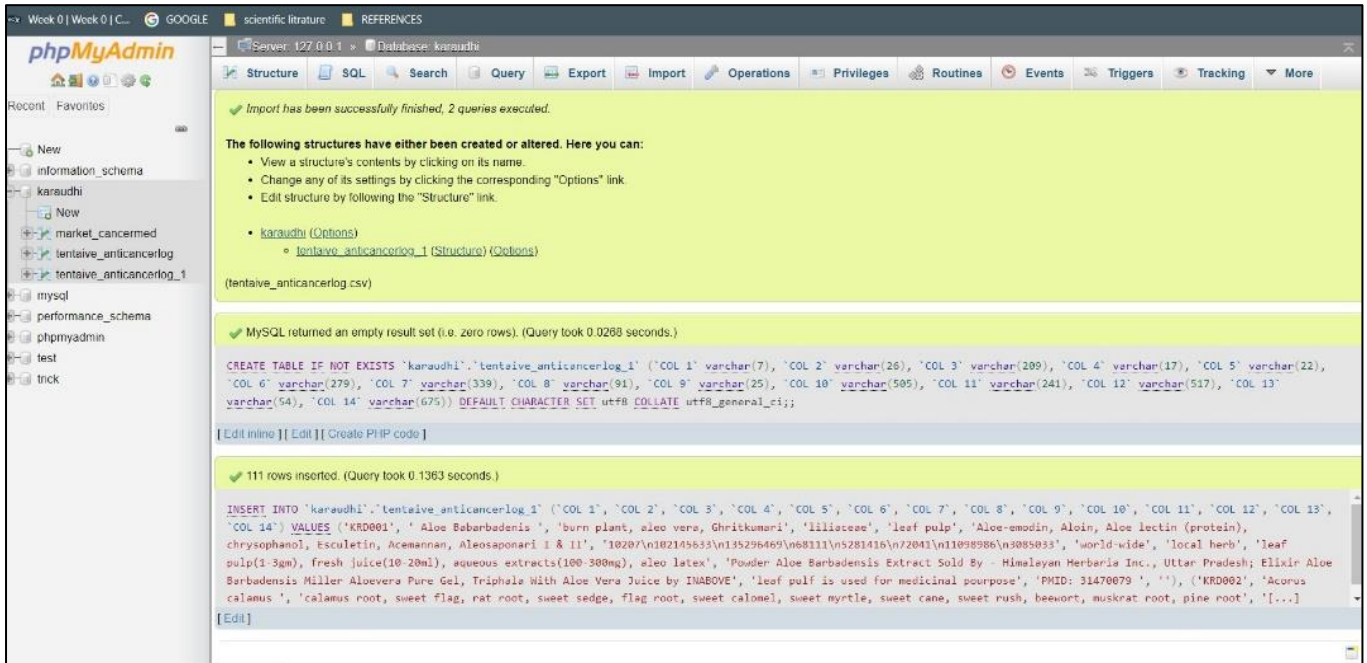


Figure 18. Database successful loaded

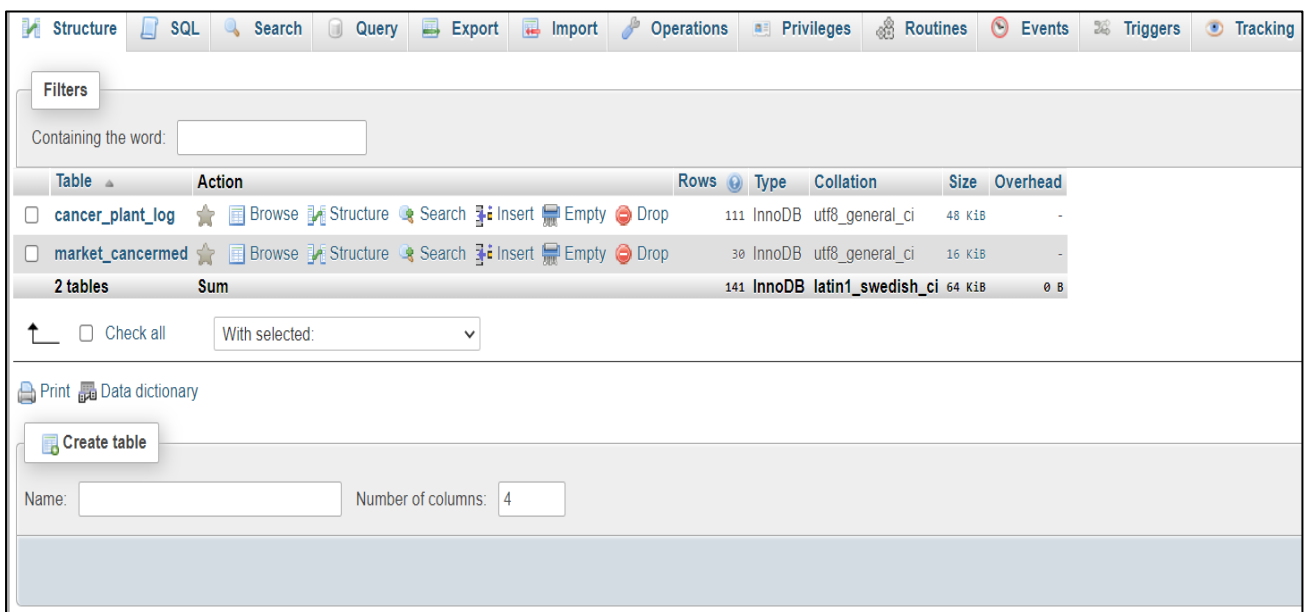


Figure 19. Final tables in database




Showing rows 0 - 24 (111 total, Query took 0.0028 seconds.)													
SELECT * FROM `cancer_plant_logs`													
<input type="checkbox"/> Profiling <a href="#">[Edit inline]</a> <a href="#">[Edit]</a> <a href="#">[Explain SQL]</a> <a href="#">[Create PH]</a>													
1 > >>   <input type="checkbox"/> Show all   Number of rows: 25   Filter rows: Search this table   Sort by key: None													
+ Options													
<div> <div>← T →</div> <div>KRD ID</div> <div>Plant Name</div> <div>Common Name</div> <div>Family Name</div> <div>Parts used</div> <div>Bioactive compounds</div> <div>PubChem IDs</div> <div>Area found</div> <div>availability</div> <div>Traditional or Culinary uses</div> <div>Extracts/medicine info</div> <div>Domestic use</div> <div>Description</div> </div>													
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>													
<input type="checkbox"/>	D001	Aloe Babarbadensis	burn plant, also vera, Ghrikumari	lillaceae	leaf pulp	Aloe-emodin, Aloin, Aloe lectin (protein), chrysop...	10207 102145633 135296469 68111 5281416 72041 1109...	world-wide	local herb	leaf pulp(1-3gm), fresh juice(10-20ml), aqueous ...	Powder Aloe Babarbadensis Extract Sold By - Himalaya	methanolic extract has significant cytotoxicity af...	leaf pulp is used for medicinal purpose
<input type="checkbox"/>	KRD002	Acorus calamus	calamus root, sweet flag, rat root, sweet sedge, f...	Araceae	rhizome, leaf	β-asarone (46.78%), linalool (0.41), farnesol (11...	223438276 6549 445070 2537 1742210 11095734 25...	India Asia Minor, Sri Lanka, Burma, Japan, China, ...		ethanolic and methanolic extracts and essential o...	hydro-alcoholic extracts		
<input type="checkbox"/>	KRD003	Actinidia chinensis	Chinese Gooseberry, Golden Kiwi, Kiwi Fruit	Actinidiaceae	leaves and fruit	Polysaccharide known as 'ACPS-R', vitamin-c	54670067	World-wide	local fruit				There are anthraqu...
<input type="checkbox"/>	KRD004	Adiantum verusutum	Evergreen Maidenhair Fern Southern Maidenhair Fern...	Polypodiaceae	leaves and stem	adiantumolostene ether,30-normethyl lupine- 20...	10598550 176286	E. Asia - Himalayas,nepal	rare hurb	A paste made from the rhizomes is used in Nepal t...			
<input type="checkbox"/>	KRD005	Aegle marmelos	bael, golden apple	Rutaceae	fruit and leaves	Butylp-tolyl sulfide, 6-methyl-4-chromanone and 5m...	584354 2355	Indian subcontinent and Southeast Asia	rare fruit	A. marmelos hydroalcoholic leaf extracts and A. m...	botanical radioprotectant- leaf extracts show pro...		The fruits can be eaten either fresh from trees or... used as a

Figure 20. First table in database 'cancer\_plant\_logs'

Server: 127.0.0.1 x Database: karaudhi x Table: market_cancermed			
Showing rows 0 - 24 (30 total, Query took 0.0020 seconds.)			
SELECT * FROM `market_cancermed`			
1 > >>   <input type="checkbox"/> Show all   Number of rows: 25   Filter rows: Search this table   Sort by key: None			
+ Options			
<div> <div>← T →</div> <div>NAME</div> <div>Site Of Action</div> <div>side-effects on organ</div> </div>			
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Altretamine (Hexalen)	Bone marrow
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Asparaginase (Elspar)	Depression, nausea and vomiting, Liver, kidney, pa...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Bleomycin (Blenoxane)	Hair loss, stomatitis,pulmonary toxicity,hyperpig...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Busulfan (Myleran)	Bone marrow, pulmonary toxicity
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Carboplatin (Paraplatin)	bone marrow, depression, nausea
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Carmustine	bone marrow, depression, nausea, toxic damage to l...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Cisplatin (Platinol)	Renal toxicity andototoxicity
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Cladribine (Leustatin)	Bone marrow depression, nausea and vomiting, fever
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Cyclophosphamide(Cytoxan)	Bone marrow depression, hair loss, nausea and vom...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Cytarabine (Cytosar-U)	Bone marrow depression, nausea and vomiting, fever
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Dacarbazine (DTIC-Dome)	Bone marrow depression, nausea and vomiting, fever
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Diethylstilbestrol (DES) (Stilbestrol)	Hair loss, nausea and vomiting, excess calcium in ...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Ethinyl estradiol (Estinyl)	Excess calcium in blood, anorexia, edema, nausea a...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Etoposide (VePesid)	Bone marrow depression, nausea and vomiting, hair ...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Generic (Brand Name)	Common Side effects To Drug
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Mitomycin (Mutamycin)	Bone marrow depression, nausea and vomiting, diarr...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Mitotane (Lysodren)	Damage to adrenal cortex, nausea, anorexia
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Mitoxantrone (Novantrone)	Cardiac labored breathing, nausea and vomiting, dia...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Paclitaxel (Taxol)	Bone marrow depression, hair loss, nausea and vom...
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	Pentastatin (Nipent)	Bone marrow depression, fever, skin rash, liver da...

Figure 21. Second table in database 'market\_cancermed'


## 4.2 WEBSITE


 KARAUDHI


HOMEABOUTBASIC SEARCHMEDICINESCONTRIBUTE

### A New Paradigm for Developing Effective Anti-Cancer Therapeutic LET'S EXPLORE !!

There remains a large chasm between the disciplines of Modern medicine and traditional science. Here is an approach to unify the knowledge, tests, and biology that works towards understanding cancer mechanisms and working towards maintain health and generating wellbeing.







#### About KARAUDHI database

Objective of this work is to provide information on local and rare species of herbs and plants showing anticancer activity. Providing comprehensive information about their formulation, phytochemicals showing anticancer property and pharmacodynamic potencies and activity of these compounds. a

This small database is based on cancer chemoprevention(prevent, impeded, curing disease) and treatment using the bioactive components derived from natural plants. Relevant molecular mechanisms involved in the pharmacological effects of these phytochemicals are also presented. All fruits, spices and vegetables be it local or exclusive have a unique benefiting quality which when put in right form and place work miraculously.hence, comprehensive anticancer medicinal data and traditional knowledge combined is present for the common people and researchers.

[About →](#)

### Contact Us

connect with to submit your data for a nobel cause.

Name

Email

Message

Submit

sakshijha238@yahoo.com

Christ College, Rajkot-360005  
"Vidya Niketan" P.B.No : 5 Saurashtra University, PO Rajkot - 360 005, Gujarat-India

**Figure 22.** Homepage- Karaudhi

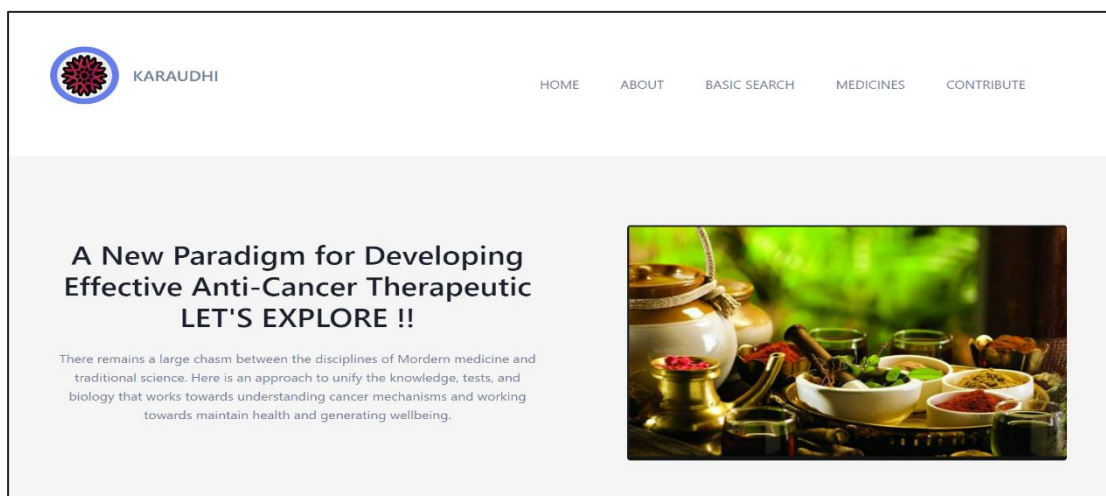


Figure 23. zoomed homepage view

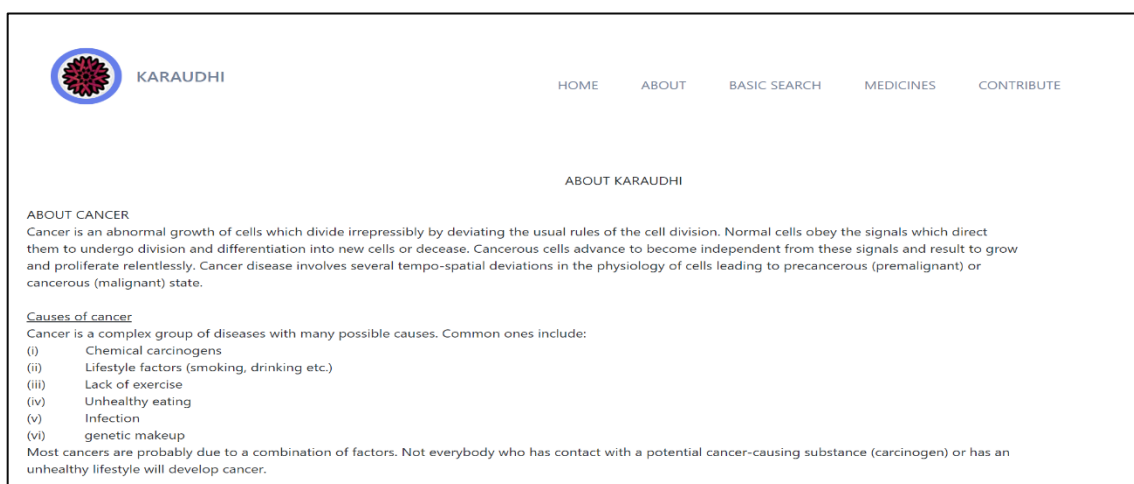


Figure 24. About page

These are zoomed view for the first page of the website and the about section which contains little information about cancer and its causes and types and the concept of Karaudhi database. The homepage has links to other pages of the website, these pages can be accessed using the navigation bar provided above. Basic search bar and medicine section are the main pages where database information is displayed.






KRD ID	Plant Name	Common Name	Family Name	Parts Used	Bioactive Compounds	PubChem IDs	Area Found	Availability	Traditional or Culinary Uses
KRD029	Caesalpinia bonducella				lycopene, amarbelin	lycopene_ PubChem CID: 446925			
KRD030	Camellia sinensis	green tea	Theaceae		Epigallocatechin gallate	Epigallocatechin gallate _ PubChem CID: 65064	southeast asia		
KRD032	Camptotheca acuminata	Happy Tree, Cancer Tree	Cornaceae		Camptotheca, Topotecan,CPT-11, 9-Aminocamptothecin	Topotecan _ PubChem CID: 60700 CPT-11_ PubChem CID: 74990	southern China and Tibet		

**Figure 25.** Basic search page

This is the image of the basic search page. Plant name is the primary key here, searches can be made using the plant name. information is provided in columns such as:

- KRD ID
- Plant name
- Common Name
- Family name
- Part used
- Bioactive compound
- PubChem ID
- Region
- Availability
- Traditional or Culinary use
- Extract/medicine information
- Traditional use
- Description



[HOME](#)
[ABOUT](#)
[BASIC SEARCH](#)
[MEDICINES](#)
[CONTRIBUTE](#)

Name	Site Of Action	Side Effects
Paclitaxel (Taxol)	Advanced ovarian cancer	Bone marrow depression, hair loss, nausea and vomiting, allergic reactions, slow heart beat
Pentastatin (Nipent)	Hairy cell leukemia unresponsive to alpha-interferon	Bone marrow depression, fever, skin rash, liver damage, nausea and vomiting
Pipobroman (Vercyte)	Chronic granulocytic leukemia	Bone marrow depression
Plicamycin (Mithracin)	Testicular tumors	Toxicity/damage to bone marrow, kidneys, and liver
Prednisone (Meticorten)	Used in adjunct therapy for palliation of symptoms in lymphomas, acute leukemia Hodgkin's disease	May be toxic to all body systems
Procarbazine (Matulane)	Hodgkin's disease	Bone marrow depression, nausea and vomiting

**Figure 26.** medicines search page

This is the image of the medicines page. medicine name is the primary key here, searches can be made using the medicine name. information is provided in columns such as:

- Name
- Site of action
- Side-effects

There has been added contribute page link of which is already added in the homepage. It is basically a search form where people or researchers who wish to contribute can provide their data. Name, Email and message sections are provided where user can enter their details and summary of data, they wish to contribute in 300 words. This form will be submitted to the admin of the website and later files can be sent via email or any convenient way by the user to the admin. This data ill be checked, curated and then later will be added to the website to be displayed on the website. Image for contribute page is shown in the next page (Figure 27)

### Contact Us

connect with to submit your data for a nobel cause.

Name

Email

Message

Submit

sakshijha238@yahoo.com

Christ College, Rajkot-360005

"Vidya Niketan" P.B.No : 5 Saurashtra University, PO Rajkot - 360 005, Gujarat-India

Figure 27. contribute page

### 4.3. Connectivity

```
includes > dbconfig.php
1  <?php
2  function getDBConnection()
3  {
4      $dbhost = "localhost";
5      $dbuser = "root";
6      $dbpass = "";
7      $db = "karaudhi";
8      $conn = new mysqli($dbhost, $dbuser, $dbpass, $db);
9      return $conn;
10 }
11
12 function closeDbConnection($conn)
13 {
14     $conn->close();
15 }
16 ?>
```

Figure 28. Connection of database and website script

```
handlers > medicineHandler.php
1  <?php
2  header('Content-Type: application/json; charset=utf-8');
3  require_once '../includes/dbconfig.php';
4  //Server Side Validation
5
6  if(isset($_POST['searchString'])){
7      $searchString = $_POST['searchString'];
8  } else{
9      $searchString = '';
10 }
11
12 $conn = getDBConnection();
13
14 if($conn->connect_error){
15     die("ERROR: Could not connect. " . mysqli_connect_error());
16 }
17 $response = array("code"=>500,"message"=>"Some Error Occured. Please try again later.", "data"=>null);
18 echo json_encode($response);
19 }else{
20     $selectQuery = "SELECT * FROM `market_cancermed` WHERE NAME LIKE '$searchString%'";
21     $stmt= $conn->prepare($selectQuery);
22     if($stmt->execute()){
23         $result = $stmt->get_result();
24         $medicines = array();
25         while($row = $result->fetch_assoc()){
26             array_push($medicines,$row);
27         }
28         $response = array("code"=>200,"message"=>$searchString, "data"=>$medicines);
29         echo json_encode($response);
30     }else{
31         $response = array("code"=>500,"message"=>$stmt->error, "data"=>null);
32         echo json_encode($response);
33     }
34 }
35 closeDbConnection($conn);
36 exit;
37 ?>
```

Figure 28. For medicines tables

```

handlers > plantHandler.php
1  <?php
2  header('Content-Type: application/json; charset=utf-8');
3  require_once '../includes/dbconfig.php';
4  //Server Side Validation
5
6  if(isset($_POST['searchString'])){
7      $searchString = $_POST['searchString'];
8  } else{
9      $searchString = '';
10 }
11
12 $conn = getDBConnection();
13
14 if($conn->connect_error){
15     die("ERROR: Could not connect. " . mysqli_connect_error());
16     $response = array("code"=>500,"message"=>"Some Error Occured. Please try again later.", "data"=>null);
17     echo json_encode($response);
18 }else{
19     $selectQuery = "SELECT * FROM `cancer_plant_log` WHERE `PLANT NAME` LIKE '$searchString%'";
20     $stmt= $conn->prepare($selectQuery);
21     if($stmt->execute()){
22         $result = $stmt->get_result();
23         $medicines = array();
24         while($row = $result->fetch_assoc()){
25             array_push($medicines,$row);
26         }
27         $response = array("code"=>200,"message"=>$searchString, "data"=>$medicines);
28         echo json_encode($response);
29     }else{
30         $response = array("code"=>500,"message"=>$stmt->error, "data"=>null);
31         echo json_encode($response);
32     }
33 }
34
35 closeDbConnection($conn);
36 exit;
37 ?>

```

**Figure 29.** For plants tables

Karadhi contains data for more than 100 plants and more than 350 phytochemicals with reported anticancer activity. It is designed to serve as a unique resource for anticancer search and as a potential lead molecules database for drug development and plant research. All the data in the database is published from books research articles, credible database sources as mentioned above. In Karadhi user can search for plants and phytochemicals and traditional and modern medicines and extracts available with their dosage regimes; under columns such as plant name, availability, traditional or culinary uses, extracts available and description. For each phytochemical under bioactive compounds section. Links for PubChem search is provided for each bioactive compound so information can further be retrieved.

Karadhi database is implemented in PHP scripts, with MySQL Database. This database includes more than 350 phytochemicals from about 110 plants. The KRD ID, Plant name, Common Name Family name, Part used, Bioactive compound, PubChem ID, Region, Availability, Traditional or Culinary use, Extract/medicine information, Traditional use, Description. in the plant section also, each plant is provided with unique KRD ID for identification purpose. Moreover, each bioactive compound has been linked to PubChem search page.

Apart from this the medicine section provides information to the on approved drugs available in market as cancer medicines or for cancer therapies, their site of action and their side effects.

Request for data submission by the user can be placed via submitted the form in the contribute section.

With anticancer research the list of anticancer plants and the natural sources of anticancer compounds is increasing day by day. This is leading to the depletion of anticancer plant resources. These compounds are readily available from the natural environment and are relatively non-toxic to healthy human cells. The herb-based companies and locals are concentrating on the collection of the anticancer plants from their natural habitats. As the market- available medicines are effective yet toxic to the body there is an increasing demand for plant-derived drugs and chemicals exploitation of these agents needs to be managed to keep up with demands and be sustainable.

Hence, Karaudhi proves to be a wonderful web resource for these plants and medicines for the common people and researchers. Not only it provides data from latest cancer research but also provides platform to the traditional formulation of these plant extracts used since ancient times that may be extinct in future. Bioactive compounds search may help in lead discovery and drug development of safer and less toxic environment friendly medicines and formulation.

Website can further be updated and improved by adding more columns of information regarding many other plants species and cross-referencing to other different databases with structural information.



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