THE DEVELOPMENT OF DIGITAL LIFE SYSTEM FOR MEDICINE PLANT BASED ON GEOGRAPHIC INFORMATION SYSTEM: CASE STUDI, MERU BETIRI NATIONAL PARK

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ABSTRACT

As one of the plasma nutfah repositories, particularly for medicine plants, Meru Betiri National Park (TNMB) is usually exploited as traditional medicine resources. This circumstance gives some serious impacts, particularly in preserving endangered medicine plants. As an in charge institution, currently TNMB still retains its plasma nutfah repository information manually and tends to partially. This information spread out in many report documents and it is difficult to be accessed. Therefore, it is worth to develop a system which could maintain, integrates, and publishes this information easily. For these reasons, this research develop a Digital Life System which is based on Geographic Information System (GIS) that will be use as information storage and information publisher to help the TNBMs' staffs to maintain their medicine plats data. From the Digital Life System development point of view, there are two main databases, *i.e.*: spatial database to hold the information about where the plants are and attribute database to hold the plants' morphology characteristic data. To enhance the data and information management, this digital life system was developed based on web GIS technology that allows all users (particularly TNMBs' staffs) to access the whole information in anytime and anywhere in easy way.

Keywords: *Digital Life, Plasma nutfah, GIS, Meru Betiri*

INTRODUCTION

Meru Betiri National Park (TNMB), which is one of the lowland tropical forests in Indonesia, is located on shout area of East Java. Based on survey that was done by TNMB team in year 2002, TNMB had 355 types of vegetation (which is fall in 92 families) and 237 of it were identified as medicine plants. This circumstance makes TNMB often regard by society as the raw material mine of traditional medicine. Therefore

Although TNMB is known as a high potential source of medicine plants, their management of information of medicine plants is still conventional and tends to

partial. Their information is spread out on some research reports and some inventory project reports. Furthermore, the information usually has no description about the distribution and the coordinate/position of medicine plan which are very important for this national park, particularly for medicine plant management.

Geographic Information System (GIS) is a computer based system that is used to store, analyze, and deliver geographic data and information which consists of spatial data (to hold the geometry data) and attribute data (to hold the properties data). By these capabilities, GIS could be used to develop a digital life information system to assist the management in managing their area properly.

MATERIAL AND METHODE

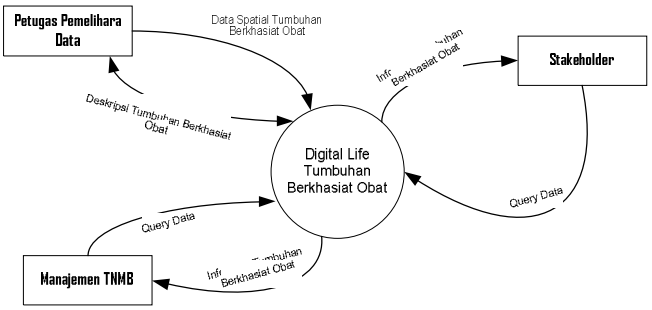
Development of Digital Life System for Medicine Plant based on Geographic Information System through 5 stages as follows.

1. Context diagram and data flow design (DFD) development: It is a graphical representation of a system that describes a system and its components based on the user needs.
2. Data dictionary development: It is an organized data element with a fixed definition in the system, so that users and systems analysts have the same sense of input, output, and data storage components.
3. Entity relationship diagram development: It is a specialized graphic that illustrates the interrelationships between entities in a database.
4. data capturing: It is a kind of data input in which there is no data entry. Instead, data is collected in conjunction with a separate activity. In this paper, data capturing is used to capture the digital map.
5. User interface development: It is an object or place where interaction between humans and machines occurs. The goal of interaction between a human and a machine at the user interface is effective operation and control of the machine, and feedback from the machine which aids the operator in making operational decisions.

RESULTS AND DISCUSSION

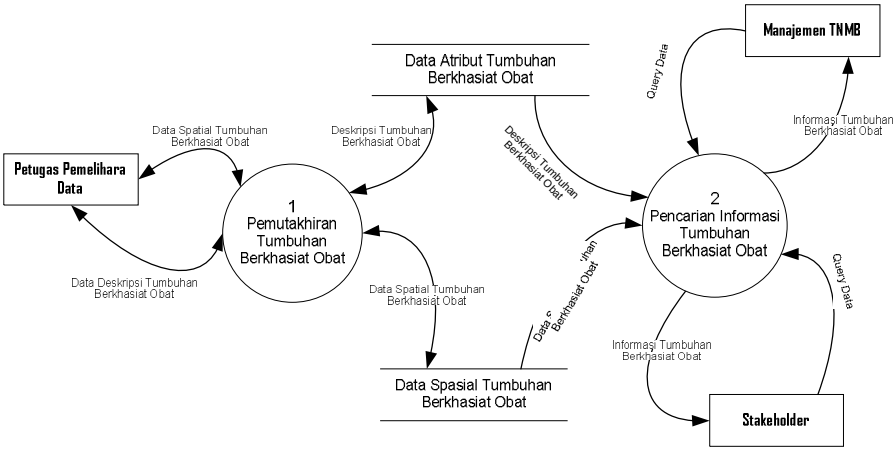
1. Context diagram and data flow diagram

Based on the system requirements, the context diagram could be presented as follows.



Context Diagram of the System

There are 3 terminators that interact with the system, *i.e.*: Data maintainer (*Petugas Pemelihara Data*), TNMB management (*Manajemen TNMB*), and Stakeholder. In detail, this context diagram could be described by DFD as follows.



Data Flow Diagram of the System

In the DFD, there 2 main processes within the system, *i.e.*: Data maintenance (Pemutakhiran data) and Information Searching (Pencarian Informasi). Data maintenance is a process to maintain all medicine plant data which has two data flows from data maintainer terminator to the process, one data flow from the process to spatial data storage, and one data flow from the process to attribute data storage. For

the information searching activity, TNMB management and stakeholder use Information Searching process to retrieve the information. This process basically has two data flows to the users (TNMB management and stakeholder), i.e. query data and plat medicine information, one data flow to spatial data storage, and one data flow to attribute data storage.

2. Data Dictionary

In detail, all data items of data flows, which are presented on DFD, can be seen in the data dictionary below.

Data Flow Name	**:**	**Data Spasial Tumbuhan Berkhasiat Obat**
1. Alias	:	-
2. Data Format	:	Digital map in Shapefile format
3. Data Flow	:	• Process 1 – "*Petugas Pemelihara Data*" terminator • "*Data Tumbuhan Berkhasiat Obat*" storage unit– Process 1
4. Description	:	Data maintainer updates the spatial data by uploading data through a form that has been provided in the application. The existing data will be replaced with the latest data uploaded
5. Period	:	Each time a user updates the spatial data of medicinal plants
6. Volume	:	Maximum 1
7. Data Structure	:	• Geometric Data

Data Flow Name	**:**	**Deskripsi Tumbuhan Berkhasiat Obat**
1. Alias	:	-
2. Data Format	:	Input Form of "*Data Deskripsi Tumbuhan Berkhasiat Obat*"
3. Data Flow	:	• "*Petugas Pemelihara Data*" terminator – Data Process 1 • Data Process 1 – "*Petugas Pemelihara Data*" terminator • Process 1 – *Data Tumbuhan Berkhasiat Obat*" storage unit • *Data Tumbuhan Berkhasiat Obat*" storage unit – Process 1
4. Description	:	Data maintainer updates the attribute data by uploading data description of medicinal plants through a form that has been provided in the application. If the data is pre-existing description, then the data will be replaced with the latest data uploaded
5. Period	:	Each time when a user updates the data description of medicine plants.
6. Volume	:	Maximum 5 per second
7. Data Structure	:	• Morphological Characteristic a. Habitus d. Bunga g. Akar

b. Batang e. Buah h. IDSpesimen
c. Daun f. Biji i. Foto Spesimen

- Classification
  a. Kingdom d. Bangsa g. Jenis
  b. Divisi e. Suku h. IDSpesimen
  c. Kelas f. Marga
- Benefits
  a. IDSpesimen
  b. Keterangan Manfaat

Data Flow Name : Query Data

1. Alias : -
2. Data Format : Searcher Form
3. Data Flow :
   - *"TNMB Management"* terminator – Process 2
   - Stakeholder terminator – Process 2
4. Description : Query data is the value of the criteria used by the user as the primary key in the search for information activity. This value is sent through a form that has been provided in the application.
5. Period : Each time a user searches medicine plant information.
6. Volume : Maximum 5 per second
7. Data Structure :
   - Jenis Tumbuhan, Khasiat, and Lokasi

Data Flow Name : Informasi Tumbuhan Berkhasiat Obat

1. Alias : -
2. Data Format :
   - Web page of information on computer screen
   - Printed information sheet
3. Data Flow :
   - Process 2 – "*TNMB Management*" Terminator
   - Process 2 – Stakeholder terminator
4. Description : The information generated from the search process based on the criteria desired by the user
5. Period : Every time after a user sends query data in order to search information on medicinal plants
6. Volume : Maximum 5 per second
7. Data Structure :
   - Morphological Characteristics
     a. Habitus d. Bunga g. Akar
     b. Batang e. Buah h. IDSpesimen
     c. Daun f. Biji i. Foto Spesimen
   - Classification
     a. Kingdom d. Bangsa g. Jenis
     b. Divisi e. Suku h. IDSpesimen
     c. Kelas f. Marga

- Benefits
  a. IDSpesimen
  b. Keterangan Manfaat

Tabel 3.1 The Spatial Data of Digital Life for Medicine Plants Database

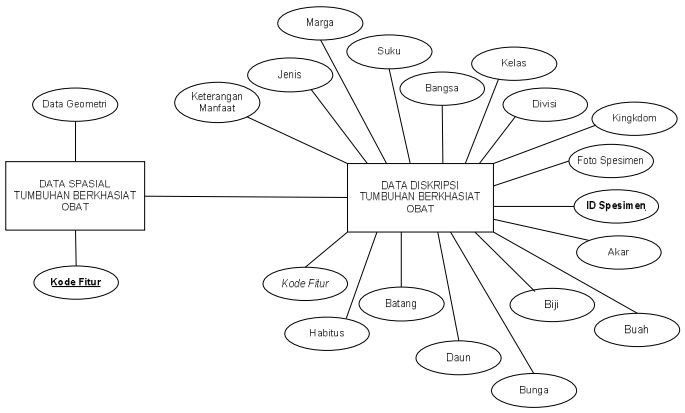
Item Data	Layer Name	Feature Class
Block of Medicine Plant	Blok	Polygon
The boundary of TNMB area	BtsTNMB	Polyline
The boundary of working area	BtsWilker	Polyline
River	Sungai	Polyline
Road	Jalan	Polyline
Land Cover	Landcover	Polygon

Tabel 3.2 The Data Dictionary of Digital Life for Medicine Plant Database

Layer Name	Column		Description
	Name	Data Type	
Blok	OBJECTID	Object ID	Object ID
	KDBlok	Text (2)	Block Code
	LUAS_HA_	Double	Block area in hectare
	SHAPE	Geometri	Geometric data of the objects
	SHAPE.area	Double	Block area in m^2
	SHAPE.len	Double	Block perimeter in meter
BtsTNMB	OBJECTID	Object ID	Object ID
	SHAPE	Geometri	Geometric data of the objects
	SHAPE.len	Double	Block perimeter in meter
LandUse	OBJECTID	Object ID	Object ID
	SHAPE	Geometri	Geometric data of the objects
	SHAPE.area	Double	Landuse area in m^2
	SHAPE.len	Double	Block perimeter in meter
	KDLANDUSE	Long Integer	Kode Landuse
BtsWilker	OBJECTID	Object ID	Object ID
	SHAPE	Geometri	Geometric data of the objects
	SHAPE.len	Double	Length of the objects in meter
Sungai	OBJECTID	Object ID	Object ID
	SHAPE	Geometri	Geometric data of the objects
	SHAPE.len	Double	Length of the objects in meter

Jalan	OBJECTID	Object ID	Object ID
	SHAPE	Geometri	Geometric data of the objects
	Type	Long Integer	The code of road type
	SHAPE.len	Double	Length of the objects in meter

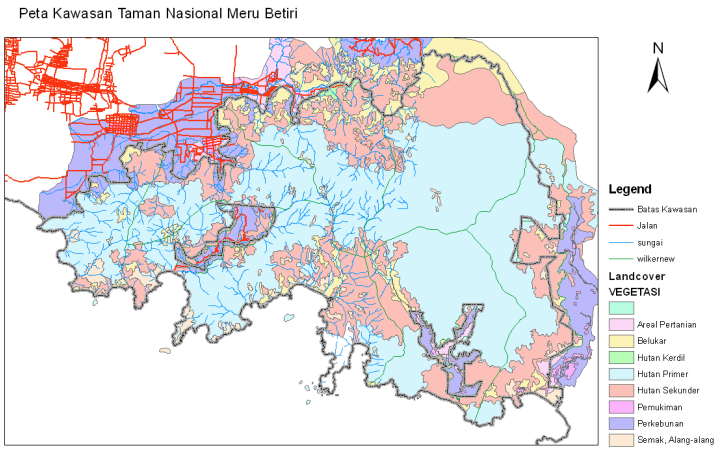
Based on DFD and the data structures in data dictionary, the diagram of entity relationship could be presented as follows.



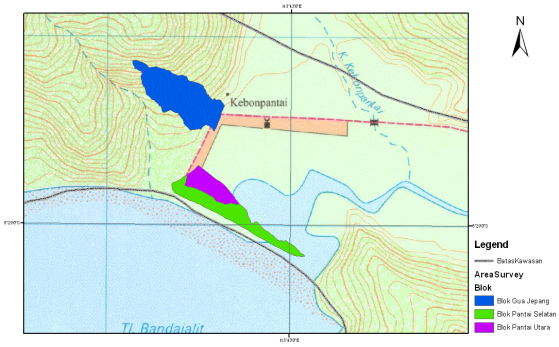
The entity relationship of the Medicine Plant Database

3. Data Capturing

The data capturing activity is aimed to produce spatial data, *i.e.*: digital map on shapefile format, through digitizing process. To maintain the information of location, this digitizing process uses Transverse Mercator coordinate system with SUTM49 for the projection system while the datum is based on WGS84.



Digital Map of Meru Betiri National Park

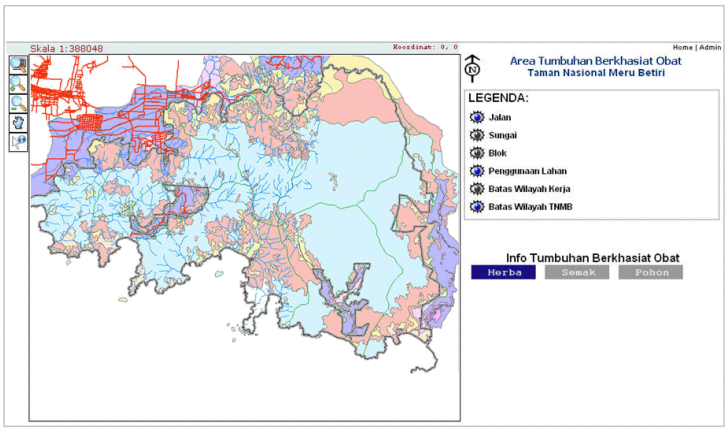


Digital Map of Three Blocks of Medicine Plants Area in Meru Betiri National Parks

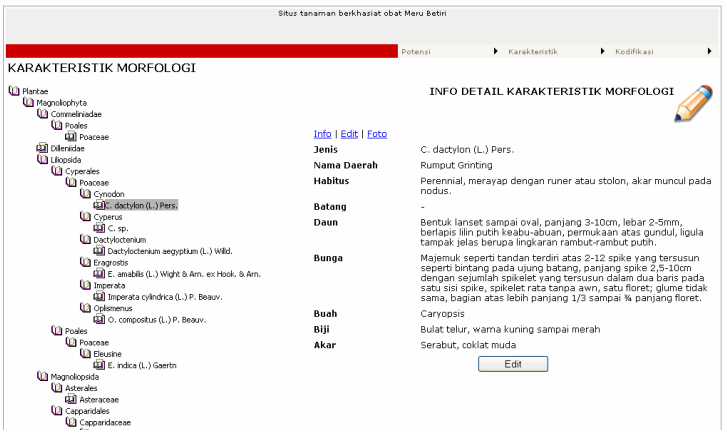
Based on the dictionary, the digitizing process produced 6 layers of feature, there are: Block of Medicine Plants (polygon), The boundary of TNMB area (polyline), Road (polyline), River (polyline), The boundary of working area (polyline), dan Land Cover (polygon).

4. User Interface

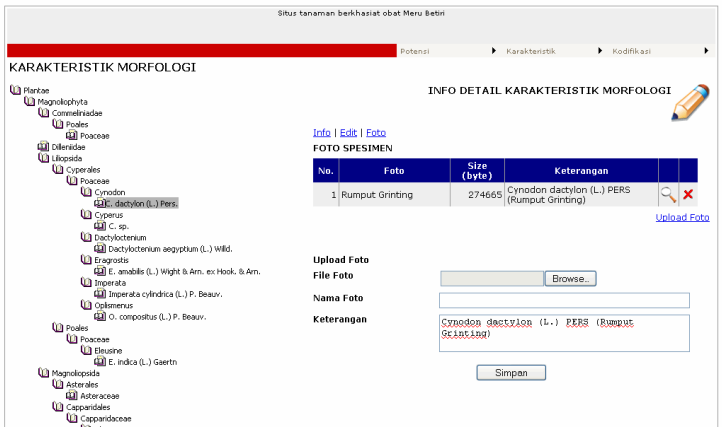
Based on the DFD has been created, there are some web forms as the user interface to enable all users to access the data.



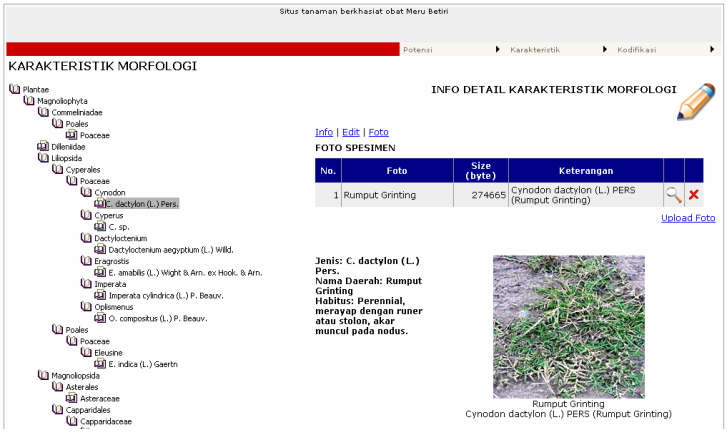
Map Display: User interface to access the spatial data (it is the main interface)



Morphological characteristic information of plant: User interface to present the detail morphological characteristics of the plant



Specimen photo up loader: User interface to upload the picture of specimens.



Specimen photo viewer: User interface to display the picture of specimens.

CONCLUSION

From the Digital Life System development point of view, there are two main databases, *i.e.*: spatial database to hold the information about where the plants are and attribute database to hold the plants' morphology characteristic data. To enhance the data and information management, this digital life system was developed based on web GIS technology that allows all users (particularly TNMBs' staffs) to access the whole information in anytime and anywhere in easy way.

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ISOLATION AND IDENTIFICATION OF PROTEOLITIC BACTERIA FROM TUNA INDUSTRIAL WASTE AT BITUNG NORTH SULAWESI.

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INTRODUCTION

Indonesia is located between two ocean, Pacific and Hindia, constructed by more than 17000 islands, with the Indonesian waters broad reach 70 % from the whole Indonesian land. The waters produce fisheries in the amount of 7,2 million tones/ year, or only 40% of its potential (Fisheries Department,2004). North Sulawesi ocean waters is passed by pelagis such as tuna potential is defined as the most export products from North Sulawesi.

North Sulawesi is one of many province exporting tuna fish as fresh products is called whole loin and pocket. Fresh tuna are obtained from modern boat caches which is equipped with refrigeration system or traditional boats bringing ice blocks. Tuna loin are obtained from whole tuna which already cropped its head, bones and skin as the waste 6 – 7 % from fish weigh. Tuna skin is one of the fish waste which not yet been maximally explored for its uses. According the observation of the writer, proximate analysis of the tuna skin contain 26,9 % protein, high protein also come from the intestine and water that use for washing tuna.

The high protein content is good the protein resources of proteolitic bacteria, which able to break the protein into amino acids. Proteolitic bacteria as resources of the enzyme protease, which could use as bating agent for tanning of leather.

So that this research was isolated and identification of proteolitic bacteria from tuna industrial waste at Bitung North Sulawesi.

MATERIALS AND METHODS

The isolation and identification of proteolitic bacteria from tuna fish was taken at the Microbiology Laboratory of fish Products of the faculty of Fisheries and Marines Sciences Sam Ratulangi University.

Research Material.

The material studied are samples taken from industrial waste Cq. The fish intestine and the samples of water used for washing tuna fish. Aquades or distilled water for the solution of the samples, NaCl as supporting solvent for the microbial test. Alcohol , stuff used for the sterilization of the equipment and Nutrient Agar (NA). The equipment used is: an Autoclave, an Incubator, Petri, Pipettes ,analogs scales, measuring glasses, test tubes, Stirrer, beaker glas, a spiritus flame, a microscope, object glass, ose neddles, Ph meter, Cuvets, Durham Tubes and Coolbox.

Methods

Samples taken from the waste water and the tuna fish intestine are obtained from the PT Nutrindo Freshfood International in Bitung (about 60 km east of Manado). The samples are taken using the swab method using sterile cotton and put into sterilized bottles, these are put in coolbox filled with crushes icecubes and brought to the Microbiology Labarotory for fish products and Marines Sciences of UNSRAT.

The isolation of bacteria, the prepare bacterial cultured as a sample is diluted in stages while the bacteria grown in the agar media should produce sufficient stock for all testing. Furtheron the growth capacity of the bacteria is measured according to the degradation of skim milk substrat. The purpose of this skim milk additive is to increase the C and N content necessary for increased microorganism growth in turn needed for active protease production.

Next is the preparation of suitable media through the addition of skim milk 2 %. All these components are put into 250 ml erlermeyer, dissolved in 70 ml distilled

water. The skimmed milk is dissolved in 30 ml distilled water. The batch is sterilized (except skim milk) at a temperature of 121 ^{0}C for 20 minutes, then poured into petridish , each containing 15 – 20 ml. After sufficient cooling we can now move ton the next step.

The produced bacteria are now regrow. With an Ose needle a free coloni of bacteria is scratched on a petridish with media nutrient agar, and skimed milk is incubated at tempoeratur37^{0}C for 24 hours. The produced bacteria will form a clear zone and should consist of single colony. The single colony so formed is then put on a solid media with an ose needle.

The Identification of bacteria.

1.The Morphological examination : this is the visual determination of morphological characteristic such as : color, shape, elevation, edging. The gram color test and the motility test

2. Biochemestry test

Biochemestry test such as : Fermented of carbohydrate test, Indol test, Metyl red test, Voges Proskauer test, Katalase test and Concentrated of NaCl.

To analyses this data were interpreted by Bergers Manual (1984).

The result were on this table :

Isolate Character	W1	W2	W3	W4	W5
Macroscopy colony	Irregular, lobate, raised, glistening, opaque	Irregular, lobate, raised, glistening, opaque	Circular, serrate, umbonate, opaque	Circular, serrate, raised, opaque	Irregular, lobate, raised, glistening, opaque
Microscopy cell	Rod shape, gram positives, endospore productio n	Rod shape, gram positives, endospore productio n	Rod shape, gram positives, endospore productio n	Rod shape, gram positives, endospore productio n	Rod shape, gram positives, endospore productio n
Motility	Motil	Motil	Motil	Motil	Motil

Biochemical Test					
Starch Hydrolisis	+	+	+	+	+
Lipid Hydrolisis	-	-	-	-	-
Casein Hydrolisis	+	+	+	+	+
Gelatin Hydrolisis	+	+	+	+	+
Glucose Fermentation	+	+	+	+	+
Sucrose Fermentation	+	+	-	+	+
Lactose Fermentation	-	-	-	-	-
H2S Production	-	-	-	-	-
Indol Production	-	-	-	-	-
Urease Production	-	-	-	-	-
Katalase Production	+	+	+	+	+
Methyl red Test	-	-	+	-	-
Voges-Proskauer Test	+	+	-	-	+
TSI Test	+	+	+	+	+
Simmon's sitrat Test	-	-	-	-	-
Nitrate Reduction	+	+	+	+	+
	Bacillus polymyxa	*Bacillus polymyxa*	*Bacillus firmus*	*Bacillus carotarum*	*Bacillus polymyxa*

Isolate Character	W6	I1	I2	I3	I4
Macroscopy colony	Irregular, undulate, raised, opaque	Circular, serrate, raised, opaque	Irregular, entire, raised, opaque	Irregular, cicular, serrate, raised, opaque	Cicular, serrate, raised, opaque
Microscopy cell	Rod shape, gram positives, endospore production	Rod shape, gram positives, endospore production	Rod shape, gram positives, endospore production	Rod shape, gram positives, endospore production	Rod shape, gram positives, endospore production
Motility	Motil	Motil	Motil	Motil	Motil
Biochemical Test					
Starch Hydrolisis	+	+	+	+	+
Lipid Hydrolisis	-	-	-	-	-
Casein Hydrolisis	-	+	+	+	+
Gelatin Hydrolisis	+	+	+	+	+
Glucose Fermentation	+	+	+	+	+
Sucrose Fermentation	+	+	+	+	+
Lactose Fermentation	-	-	-	-	-
H2S Production	-	-	-	-	-
Indol Production	-	-	-	-	-
Urease Production	-	-	-	-	-
Katalase Production	+	+	+	+	+
Methyl red Test	-	-	+	+	-
Voges-Proskauer Test	+	-	+	-	-
TSI Test	+	+	+	+	+
Simmon's sitrat Test	-	-	-	-	-
Nitrate Reduction	+	+	+	+	+

	Bacillus macerans	*Bacillus carotarum*	*Bacillus circulans*	*Bacillus epiphytus*	*Bacillus carotarum*