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## **L-Asparaginase: A Boon for Cancer Treatment**

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### **ABSTRACT**

*L*-asparaginase (LA) (EC. 3.5.1.1.) also known as L-asparagine amidohydrolase catalyses the hydrolysis of asparagine into aspartic acid and ammonia. It is used to treat Acute Lymphoblastic Leukemia and Hodgkin disease. LA can be obtained from bacteria, fungi and plants. In this review we have emphasized on the structure of LA, its production via solid state (SSF), submerged fermentation (SMF), and Nesslerisation, also its applications as therapeutic agent and in food industries and potential harmful effects. Due to the GRAS status of probiotics, LA isolated from the same lactic acid bacteria has fewer side effects, here we have suggested what further research should be done to improve the quality of LA formulation and decrease its toxicity.

**KEYWORDS:** L-asparaginase, Antineoplastic agent, L-asparaginase structure, Mechanism of action, Lactic acid bacteria

### **INTRODUCTION**

Numbers of cases of cancer has been multiplied by several fold in recent years. Cancer is a group of diseases which shows uncontrolled cell growth and spread of these mutated cells to other normal body parts. There are many types of cancers like colorectal, prostate, lung, stomach, breast, skin, leukemia, cervical cancer etc. [1] Thus, there is an increasing need to emphasize on the discovery of anti-cancer compounds or anti-neoplastic agents. Several compounds and enzymes are available which can be used as anti-cancer agent. LA is one of the therapeutic enzymes approved by the Food and Drug Administration and World Health Organization, Microbial L-asparaginase formulations for biomedical applications currently contribute to one- third of the global requirements for antileukemia/anti lymphoma agents. This is far higher than other therapeutic enzymes and L-asparaginases have been widely used for anti-leukemia chemotherapy in acute lymphoblastic leukemia (ALL) disease, especially in children. As a result of L-asparaginase's effective role as an antineoplastic agent in the treatment of ALL, it has been used in non-Hodgkin's lymphoma, pancreatic carcinoma, and bovine lymphoma sarcoma, acute myelomonocytic leukemia, acute myelocytic leukemia, and myeloid leukemia has gone. Leukemia, Chronic Lymphocytic Leukemia, Reticulum Sarcoma, Lymphosarcoma and Melanoma Sarcoma [2,3].

### **HISTORY OF L- ASPARAGINASE**

L-asparaginase (EC 3.5.1.1) first discovered in 1905 by Lang [4], belongs to a group of homologous amidohydrolases family, which catalyses the hydrolysis of the amino acid L-asparagine to L-aspartate and ammonia [5]. It is the first therapeutic enzyme to be in consideration to be used as a drug to treat various cancers for its anticancerous properties. Further information was not available about its mode of action or target until 1922 when Clementi observed the presence of LA in the blood serum of guinea pig [6]. Kidd (1953) performed series of experiments suggesting the tumor inhibiting activity of guinea pig serum [7]. He carried out various analyses where he studied that two different subcutaneously executed Lymphosarcoma in mice failed to escalate once animals got injected with the serum of guinea pig, while untreated controlled mice died because of carcinomas. In second experiment, two different types of lymphomas namely mammary carcinoma and fibro



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## ASSESSMENT OF FERTILITY STATUS OF SOIL OF GANDHINAGAR DISTRICT, GUJARAT, INDIA

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### ABSTRACT:

Gandhinagar is the capital city of Gujarat State. The paper deals with the estimation of nutrients in soil of different talukas of Gandhinagar district. This district has four talukas with 290 villages and 10 urban habitations in the district. For the study purpose, the entire district was divided into 05 sites. One site of each taluka was selected. Total 05 sampling sites were selected to collect samples. Soil samples were collected and analysed for their physico-chemical properties like pH, EC, % Organic Carbon, Chloride (Cl), Nitrogen (N), Total Alkalinity, Calcium and Magnesium. pH showed alkaline soil. Parameters analysed in the soil of Gandhinagar district and they were recorded as per the standard, it became evident that, the soil of Gandhinagar district is fertile and suitable for the study purpose.

**KEYWORDS:** Assessment, Fertility, Soil, Gandhinagar, Gujarat, India.

### INTRODUCTION:

Biologically, soil may be considered as a weathered outer crust of the earth in which remains and products of decay of living organisms are finely mingled. Ecologically, it may be defined as the part of the crust of the earth in which roots of plants are actually growing. Release of mineral elements during decomposition of litter increases fertility of soil (Charly and West, 1975). According to Marbut (1935) soil may be define

as, “the natural medium for the growth of land plants on the surface of the earth composed of organic and mineral materials.” Fertile soil is the most important source for the entire living world. Apart from providing a solid substratum on which we live, the soil provides us most of our necessities through the plant and animals communities which develop on it (Asthana and Asthana, 2003). Soil testing is one of the best available tools to ascertain the physical characteristics and nutrient status of a field so as to assess the fertilizer requirement (Singh, 2007).

### ***MATERIALS AND METHODS:***

The collection was made with repeated field trips. Soil samples were collected from selected sites and analyzed for their physico-chemical parameters like pH, EC, Alkalinity, Chloride, Total Hardness, Ca, % Nitrate. The sampling was done by method of Piper (1950). Samples were analyzed as per methods suggested by Trivedy and Goel (1984).

### ***RESULT AND DISCUSSION:***

The standards by District Agriculture Plan (DAP) are given in Table – 01. The values of physico-chemical parameters analysed in present study in soil are given in Table-02. The value of pH was recorded high (8.34). pH above 7 indicates the alkaline nature of soil. EC indicates the presence of electrolytes in soil. The value of EC ranged between 0.31m.mho.cm<sup>-1</sup> to 0.73m.mho.cm<sup>-1</sup> in all 5 samples. Soil with EC greater than 4m.mho.cm<sup>-1</sup> indicate the salinity in the soil (Sharma and Kaur, 1994). In present study EC ranges from 0.31m.mho.cm<sup>-1</sup> to 0.73m.mho.cm<sup>-1</sup> which shows that soil is not saline in nature (Karlikar, B. H. and Solanki, H. A., 2014). The value of organic carbon was highest (0.71 ppm) in S2 and lowest (0.44 ppm) in S5. Decrease in OC may be due to its high demand by living organisms (Solanki, 2001). The nitrogen value was found highest (0.052 ppm) in S2 and low (0.038 ppm) in S5. Nitrogen value was quite high (0.050 ppm) and quite low (0.40 ppm) in remain other soil samples (Table-01). The high or low value of nitrate could be correlated with soil organisms that is nitrogen fixing soil algae, as well as nitrifying and denitrifying bacteria and utilization of nitrate by plants and other living organisms including worms etc. for synthesis of amino acids (Singh, 1996 and Ahluwalia, 1999). The value of chloride was ranged between 53.7 ppm (S1) to 271.5 ppm (S3). Alkalinity in natural waters and soils is formed due to dissolution of CO<sub>2</sub> (Trivedy and Goel, 1986). The maximum value (618.1 ppm) of alkalinity was observed in S3 and minimum value (183.3 ppm) was recorded in S4. Total hardness is mainly due to the presence of Ca and Mg hardness (Trivedi and Goel, 1986). Maximum value (251.5 ppm) of TH was obtained in S5 and minimum TH value (40.9 ppm) in S1 (Table - 01).

**CONCLUSION:**

The present study was carried out on 5 selected sites located at four talukas of Gandhinagar district. In present study physico-chemical characteristics of soil were estimated. Soil samples were analysed for their physico-chemical properties like pH, EC, % Organic Carbon, Chloride (Cl), Nitrogen (N), Total Alkalinity, Calcium and Magnesium. pH showed alkaline soil. Parameters analysed in the soil of Gandhinagar district and they were recorded as per the standard, it became evident that, the soil of Gandhinagar district is fertile and suitable for the study purpose.

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Table 01: Standards (DAP Gandhinagar)

Taluka	Parameters	
	pH	EC (m mho/cm)
Gandhinagar	6.5 to 7.5	0.25 to 0.75
Dehgam	6.5 to 7.5	0.25 to 0.75
Kalol	6.5 to 7.5	0.25 to 0.75
Mansa	6.5 to 7.5	0.25 to 0.75

Source: Soil fertility indices (DAP) - Gandhinagar

Table 02: Physico – chemical characteristics of Soil of Gandhinagar

PARAMETERS	Samples				
	1	2	3	4	5
pH	8.34	8.34	8.30	8.34	8.37
EC	0.56	0.73	0.61	0.58	0.31
Organic Carbon	0.62	0.71	0.54	0.51	0.44
Nitrogen	0.05	0.50	0.40	0.50	0.038
Chloride	53.7	85.2	271.5	160.2	90.3
Alkalinity	502.6	307.0	618.1	183.3	370.5
Calcium	12.6	118.2	78.6	125.2	90.7
Magnesium	28.3	96.3	91.7	78.3	160.8
Total Hardness	40.9	214.5	170.3	203.5	251.5

Parameters in ppm, except pH, EC = m mho/cm