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USE OF EXPONENTIAL FUNCTION IN PLANT GROWTH ANALYSIS: A MATHEMATICAL STUDY OF HERBAL PLANTS IN NEPAL

Kritika Kumari Thakur[1], Suresh Kumar Sahani[*2], Ambika Kumari Thakur[3], Kameshwar Sahani[4], Nayan Kumar Prasad[5], and Binod Kumar Sah[6]

[1,3]MIT Campus, T.U., Janakpurdham, Nepal; [2]Rajarshi Janak University, Janakpurdham, Nepal; [4]Kathmandu University, Nepal; [5,6]R.R.M. Campus, T.U., Janakpurdham Nepal
kritikasharma2042@gmail.com; sureshsahani@rju.edu.np

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Abstract

Plants are the reason why we all human beings or living beings are alive. We are nothing without plants. We Nepalese are lucky that we don't only have a large variety of plants but also many more rare plants which are not easily found all over the world. Some of the rare plants are Rhododendron, Jatamanshi, Yarshagumba, etc. which not only have medicinal importance but also are very expensive. Above 80% crude herbs are exported to India, China and other countries. But one of the saddest things is Nepal hasn't yet become one of the most popular or largest countries to export herbs. Maybe because we are surrounded by land. But there are various geographical importance of Nepal. We should consider it and extend the export rate. Nepal is rich in medicinal plants and aromatic plants, from Terai to Himalayan region. Due to the geography, Nepal. Consists of some of the unbelievable medicinal herbs which can cure various diseases. In this project I have discussed some of the precious herbal plants found in Nepal.

Keywords:- Rhododendron , Aromatic , Jatamansi

Introduction

As we all know , Nepal is a country of greenery . It is an agricultural country, ' Hariyo ban Nepal ko dhan', not only green forest but also many herbal plants are found in Nepal . Nepal is rich in many ways, whether plants, many more , Nepal occupies 1,47,51,600 hectares of land in the world.

Nepal is a land locked country. Still there are various things Nepal can export from himalayan to the Terai region . Nepal is rich in various kinds of climate too. 45^0c in terai and -10^0c to -20^0c or even lower, heavy and more cold can be found in himalayan region of Nepal , temperate type of climate can be found In hilly region of Nepal

There are 1600-1900 plant species found in Nepal, in which large amounts of plants are used for medicinal purposes Nepal has 2% of the world's flowering plant and 7000 species are higher value plants found in Nepal. There are 5856 flowering plants recorded in Nepal, 690 have medicinal properties. In which panchAule and yarshagumba are two most rare plants found in Nepal. Not only these, some notable rare plant species like Himalayan blue poppy, the national flower of Nepal Rhododendron,and the aromatic spikenard. We are not only rich in rare medicinal plants but also rare animals like Bengal tiger and exclusive show leopard are also found in Nepal. According to the recent reports, 8.5% of Nepal's herbal plants are collected from the mid-western & far- western parts of the country.

There are many herbal plants found in Nepal like sugandhawal , zedoary , cinnamon , chamomile , citronella , juniper , berries, lemon grass used for making essentials across seas like US, Europe , and within the continent like in east Asia , India . One of the most highly valuable seeds, Rudraskha is also found in Nepal . King of herbs Ganoderma is also found in Nepal.

Some of the important herbs found in Nepal are described below:-

Yarsagumba

Parasitic fungus yarsagumba is found in alpine regions, is highly valuables medicinal plants . It is a mushroom that's growing on a ghost moth larva. Lepidopteran insect depending upon the local weather, snow conditions and elevation of the collection location, the yarsagumba is collected from the second week of may and lasts until the end of july the average cost of yarsagumba in Nepal is 2500000 per kg .

Rudraksha

Rudraksha is a kind of medicinal seed. It not only has spiritual importance but also medicinal importance. The best part is the most popular variety of rudraksha is found in Nepal .There are various kinds of rudraksha from no mukhi or 1 mukhi to 21 mukhi rudraksha . Each of every rudraksha has its own culture and scientific importance in our daily life. In Nepal, it is mostly grown in sankhuwasabha, khandbari, Dingla bhojpur, Kavre, Sindhupal chowk, Kathmandu, etc.

The maximum price of rudraksha found in Nepal is more than $10000.

Lemon grass

Lemon grass is a plant in the grass family. It is also known as cymbopogon , barbed wire grass , silk heads , oily heads, cochin grass , malabar grass , citronella grass , fever grass. It is used for extracting essential oil for soap, it is also used as an antiseptic against fever, it is also used in household disinfectants.

Ganoderma

Ganoderma is a type of fungi or mushroom. Ganoderma is also known as Red mushroom, Ganoderma lucidum is a kind of medicinal plant which can cure various diseases like:- cancer, brain tumor,immune- boosting effects, liver diseases, hypertension, asthma, diabetes, insomnia, etc. if used in the right amount. The harvesting of Ganoderma was started 33 years ago. Ganoderma can be purchased, 1kg at rs. 20000/kg.

Definition

Exponential functions have many applications to the growth process and decay process. Examples of growth process are population growth, growth in GNP, growth in the value of assets, etc. Examples of decay processes are declining the value of assets of machinery, declining the rate of incidence of certain decreases as medicinal research improves, etc.

1. **Unlimited growth rate:**

   The function modeled by the equation $ft=ae^{rt}$, where a and r are constants, is called unlimited growth function. Investment and some models of population growth are examples of unlimited growth function.

2. **Unlimited decay function:**

The function modeled by the equation $ft=ae^{-rt}$, where a and r are constants, is called an unlimited decay function.

3. **Limited growth function:**

The function modeled by the equation ft=M1-e-rt, where M and r are constants, it is called a limited growth function. Consumption functions, sales with advertising, etc. are some examples of unlimited growth functions.

4. **Logistic growth function:**

The function modeled by the equation t=M1+ae-rMt , where M, a and r are constants, is called logistic growth function. Constrained population growth of epidemics, sales, etc. are the examples of logistic growth function.

Problem:-1

Let the price of 1 piece of Yarsagumba is rs. 600 and the rate of price increases exponentially by 66.66% per year, what will be the price after 5 years.

Solution**:**

Original value(V_0)= rs. 600

Percentage rate of growth(i)= 66.66100 =0.6

Time period(n)= 5 years

Value of Yarsagumba after 5 years(s)= ?

Now,

S= $V_0 e^{in}$

=600*$e^{0.6*5}$

=600*20.0855

=12051.3

Problem:-2

The price of 1 piece of 20 mukhi rudraksha is $10000, let the rate of price increase exponentially by 2%, what will be the price after 10 years.

Solution:

$1= rs. 133.74

Original value(V_0)= rs. 1337400

Percentage rate of growth(i)= 2100= 0.02

Time(n)= 10 years

Value of rudraksha after 10 years(s)= ?

Now,

$S= V_0e^{in}$

$=1337400*e^{0.02*10}$

$= 1337400*1.2214$

$=1633500.36$

= $12214

Problem:- 3

How long will it take for lemongrass to grow if we reduce to half of its original cost price if the value decreases by 20% per annum exponentially ?

solution:

let the original value be v

Rate percentage (r)= 20%

I= 0.2

Time period(n)= ?

We know that,

$S = \frac{v}{2}$

Or, $\frac{v}{2}= v* e^{0.2n}$

Or, log (0.5) = 0.2n

Or, 0.6930= 0.2n

Therefore, n= 3.465 years

Hence, it will take 3.465 years for lemongrass to grow if we reduce to half of its original cost price.

Problem:- 4

The price of 1 kg Ganoderma is Rs. 20000/KG and the let rate of price increases exponentially by 4% per annum. What will be its price after 2 years ?

Solution:

Original value()=rs. 20000

Percentage rate of growth(i) =$\frac{4}{100}$ = 0.04

Time period(n) = 2 years

Value of ganoderma after 2 years(s) = ?

We know that,

S= $v_0 e^{in}$

= 20000 *$e^{0.04*2}$

= 20000 *$e^{1.08}$

= 20000 * 2.94

= 58800

Therefore, the price of ganoderma will be rs. 58800 after 2 years.

Conservation and conclusion

Due to various reasons the conservation of herbal plants has been more difficult but different conservation programme are being launched to preserve those rare plants, for the sake of preserving biodiversity. Development of infrastructures is good but we should not even forget the development and conservation of those, from whom we are able to survive.

From the above research, we can conclude that Nepal is rich in biodiversity. There are various rare plants including Yarsagumba, Chilaune, Rhododendron, Rudraksha, Ganoderma are found in the upper region or himalayan and hilly region of Nepal. We should preserve these plants for our coming generations. So that not only we but they would also be able to get information about these rare plants. There are various challenges also to conserving these plants/ herbs such as climate change, habitat destruction, overharvesting, people are not much informed about the importance of these plants.

Various programmes are being launched to protect these areas. Nepal is an independent country, if all the herbs are preserved properly than more harmless, chemicalless medicine can be manufactured and more employment can be done and we would be able to conserve our human resources within us.

This is important because it promotes the herbal importance of Nepal. It promotes and provides Nepalese about the importance of conservation. We can even sale those rare plants directly and can make medicine out of it and sale it in international market and we can use the money earned from sales in future for preserving those rare flora and fauna, literature and heritages of Nepal which were looted. It can further help us to form an enlightened Nepal.

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