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# A Mathematical Model of Single Species Tree

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**ABSTRACT**
Presented herein are the studies of growth of single species trees. The parameters specified$\alpha$ , $x_0$ , $k$ *and* $t$. It has been observed that the increases of k, increase the single species tree. Again it has been observed increases the time increase the number of single species tree.

***KEYWORDS:*** *Forest resources, influence, stream, growth, sheds*

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## INTRODUCTION

The forest makes up the earth's greatest reservoirs of renewable resources. They can provide essential products. Forest management is the places of organizing forest stands. They produce a continuous stream of resources from that forest as timer, wildlife, tourism and recreation of the scientific and economic principles. The forest management is the practical application of science, technology and economics to a forest estate for the achievement. It is branch of mathematics which is concerned with the determination of dimension, volume, age of and interment of logs, sinful, tree etc.

The three main parts of a tree producing wood are the stem, and branches and the roots. The stem wood is most important out of these. The aim of the forester to produce trees having the maximum proportion of stem wood. The factors influencing the shape and dimensions of the trees. The root wood is the species, the density of the crop, the age of tree, the soil and locality.

Leaves of trees and other plants are used for various proposals such as folder, litter and manure. A young plant from the time when it reaches 1m in the height till the lower branches begin to fall . In the absence of dead bark and vigorous height growths. The stage of growth beyond the pole stage of height growth begins to slow down and crown expansion. Crown differentiation amongst trees occurs due to intense competition for light. The strongest tress growth rapidly and form the uppermost canspy.

Trees shed old leaves regularly new leaves come either when the old leaves are still present on the branches. These are supporting system reinforcing the lateral roots to held grant tree trunks straight against wind. It is an outgrowth from the base of the tree connecting it with roots.

From stages in the growth of a tree are dusting wished. From germination up to a height of one meter. The young plant of a tree species is called seedling the shape and size of the crown and its proportion to the pole and root systems are characteristics of species. Deodar is a tall tree with a straight pole whereas sirsoo has short. The form of trees depends on environment. Thus teak trees grown in a plantation have clean, straight poles, small crown and a superficial root system. The mode of branching is characteristic. Some branches grow upwards, other grow downward or may be horizontal some trees are evergreen that their leaves are shed. Teak sheds its leaves easier in M.P. Forest trees when suddenly isolated, throughout small branches.

Some trees are short lived other like for hundred of year such as deodar Banyan is more or lies immortal as

throughout aerial root which strike the ground and penetrate the soil. The trees to absorb more nitrogen, phosphorus and potassium. It has been fowl that trees can grow belter in soil containing.

Light is essential for plant to grow. Many trees are light, domineers such as teak etc. overhead they require light for their proper development. In the absence of light leads to death of both leaves and branches. The lower site branches of trees are killed and shed when they are shaded by their own crowns. When light strikes the leaves, part of it is absorbed by the chlorophyll in them. This brings about the assimilation of atmospheric carbon dioxide and the formation of carbohydrates. Such respiration increases the carbon dioxide in the soil which them diffuses in the air and it utilized by the growl vegetation for photo-synthesis. Proteins are formed in the leaves.

For growth plants take up major primary nutrients N, P and K in large quantities and major secondary nutrients Ca, Mg and S in appreciable quantities. All these each nitrogen is present in the soil derived from the weathering of rocks. It is awarded through mineralized salts such is nitrates but some plants also have the power to take up nitrogen as ammonia. It promotes root growth. It increases the resistance of plants to pest. Hormones found in plants which control specific growth.

Some investigations[1,3,4] have studies the problem of forest growth from various point of view. The problem has been studied by various authors theoretically as well as mathematical modeling[7,8,9] , computing interests and uses for forest resources will require new approaches to balance social needs and resource capability[2,5,6]. This is future of forest. The possibilities are challenging and intriguing.

In this paper we considered the size of single species tree.

**Formulation of the problem**

The detail some of the model outputs will be performed. This model is of relevance studies in particularly in the real world. In the model considered the size of single species tree.

Let x(t) be the number of single species tree at time t. The model equation is

$$\frac{dx}{dt} = \alpha x\left(1 - \frac{x}{k}\right) \quad (1)$$

Where $\alpha > 0$ , $k > 0$

Now separate the variables, we get

$$dt = \frac{kdx}{\alpha x(k-x)} \quad (2)$$

Or

$$\alpha dt = \left[\frac{1}{x} + \frac{1}{(k-x)}\right] \quad (3)$$

With boundary condition,

$$x = x_0 \text{ at } t = 0 \quad (4)$$

**Solution of the problem**

Integrating equation (3), we get

$$\alpha t = \log x - \log(k - x) + \log A \quad (5)$$

Applying the boundary condition (4) in equation (5), we get

$$0 = -\log\left(\frac{k-x_0}{x_0}\right) + \log A$$

$$\log A = \log\left(\frac{k-x_0}{x_0}\right)$$

$$\alpha t = \log\frac{x(k-x_0)}{x_0(k-x)}$$

Or

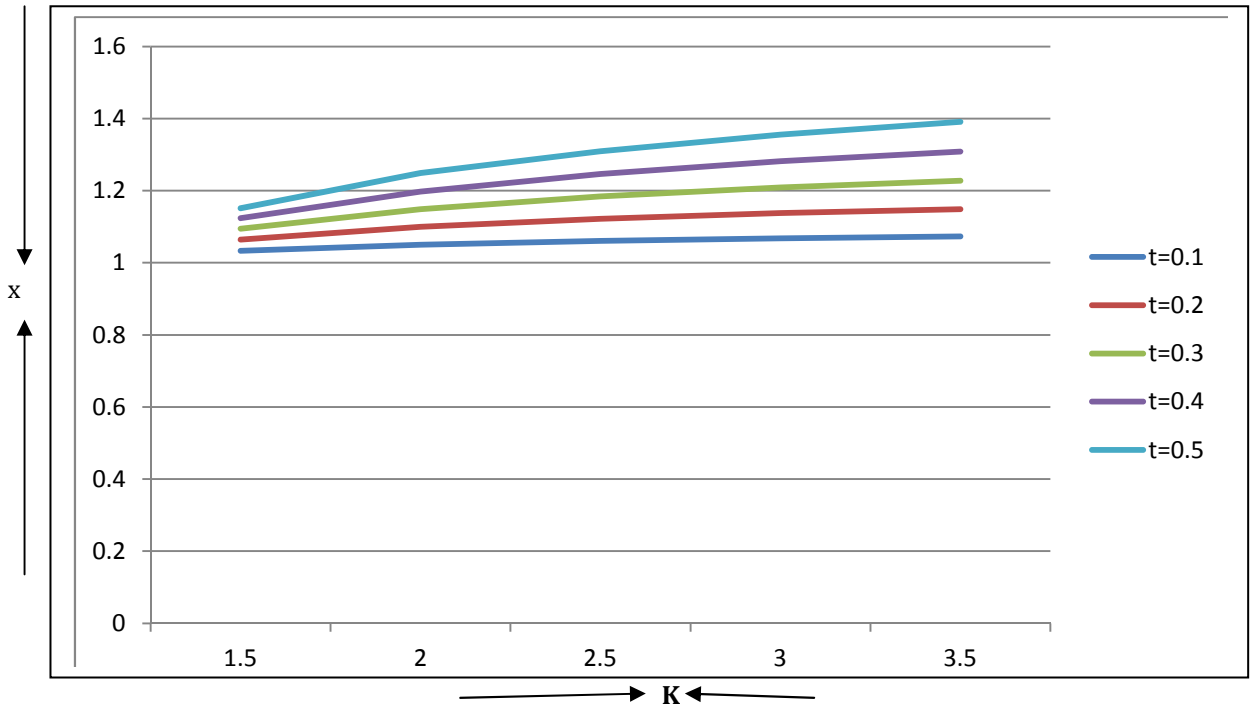
$$x(t) = \frac{x_0 k}{x_0 + (k-x_0)e^{-\alpha t}} \quad (6)$$

**Result and discussion**

The presented paper proposes a more realistic model for explaining the single species tree. The number of single species trees depends upon parameter k and t. it has been observed that the increases of k, increase the single species tree. Again it has been observed increases the time increase the number of single species tree.

**Variation of single species tree for different value At $x_0$=1 and $\alpha = 1$**

| K \ t | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |
|---|---|---|---|---|---|
| **1.5** | 1.0327 | 1.0643 | 1.0946 | 1.1235 | 1.1510 |
| **2.0** | 1.0500 | 1.0997 | 1.1489 | 1.1974 | 1.2492 |
| **2.5** | 1.0606 | 1.1220 | 1.1842 | 1.2466 | 1.3090 |
| **3.0** | 1.0677 | 1.1375 | 1.2089 | 1.2818 | 1.3556 |
| **3.5** | 1.0729 | 1.1487 | 1.2278 | 1.3080 | 1.3909 |




**Variation of single species tree of k & t At $x_0$=1 and $\alpha = 1$**

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