Eradication Of Plants And Trees From Historic Buildings And Monuments

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Introduction:

No life can be expected on earth without vegetation but the growth of plants on historic buildings and monuments can cause serious problems. The problems can be quite serious in tropical countries like Nepal where the climatic condition is quite favourable to plant growth.

Although a small country, the cultural heritage of Nepal is very vast. Sculptures, Paintings, Manuscripts, Tad-patras, Bhoj-patras, Historic buildings and Monuments created by our ancestors over the years are a source of inspiration for the present and future generations. Therefore, one of the major tasks before the present generation is to rise to the challenge of preserving the vast and varied cultural properties for future generations. Although the complete answer to many burning questions of conservation is still a distant cry but the achievements made by our scientific conservators may be termed as satisfactory.

On the basis of the life span of a plant, it may be classified as (1) Annuals-living for one year (2) Biennials : - living for two years (3) Perennials: -live for 3 or more years Ex-Peepal Bhimsenpati etc. Again on the basis of the development of organs, plants can be classified as -

(1) Higher plants

(2) Lower plants

(1) Higher plants: - Those plants which have definite vascular system (Xylem, Phloem) are known as higher plants. Vascular system is responsible for transport of food materials from the root to leaves and to throughout the body . Ex-People, Bhimsenpati etc.

(2) Lower plants : - Those plants which do not have definite vascular system are categorized as lower plants. Ex - Algae, Fungi, Lichen, Moss etc.

Factors affecting plant growth: - The three most important factors which affect the growth of

plants in the soil are also responsible for their growth on monuments.

(1) Light: -Light is essential for photosynthesis, a process by which plants manufacture their food. Therefore the quality, duration and intensity of light available to the plants is of utmost importance in their growth on monuments. The growth of plants is limited in conditions of low light.

(2) Nutrients: - The availability and type of nutrients present in the substrate also play an important role in the growth of plant. Nutrients can be either organic or inorganic in nature. The organic nutrients may be either an impurity in the substrate or a decomposition product of other microorganisms. The inorganic nutrients are usually the mineral constituents of the substrate.

(3) Water: - Water is an important factor in plant growth.

Besides these three factors the climate of the region where the monument is located also has a profound effect upon the growth of plants. Generally a warm and humid climate is conducive to plant growth. Another important aspect which affect the plant growth is exposure to drying agents like wind and sun. This is evident from the fact that south facing walls are poor in vegetation whereas north walls provide an ideal condition for plant growth.

Damage caused by plants: - The damage caused by plants to the monuments can be summarized as follows: - Plant growth on monuments is responsible for the widening of gaps between adjoining blocks or increasing the dimensions of the cracks already present on the surface. Plant growth can increase load on the surface thus resulting in the dislocation of the surface.

Besides causing such type of physical damage to the monuments, it can also affect chemically by giving out exudes which react chemically with the surface. There is evidence that marble and limestone in contact with roots develop root marks due to the etching effect of the slightly acidic sap of the root cells. Rotting roots can also stain calcareous stones and they produce humic substances according to Winkler (1966).

Methods for the removal of plants from the historic buildings and monuments: - Generally there are two methods for the eradication of plants from monuments and historic buildings.

(1) Physical method

(2) Chemical method

(1) Physical method: - In this method, the plants are controlled by uprooting them at their initial stages of developments. The fully grown plants can be controlled by cutting them with suitable sharp cutting instruments like Khukuri, Sickle etc. This method is not a permanent solution for the control of plant growth in the monuments and historic buildings because plants like Peepal (ficus Vulgaris) may regenerate with more vigour when they are cut. However it may be a very effective method for the prevention of plant growth when applied during initial stages of development of plants in the historic building and monuments.

(2) Chemical method: - In this method certain chemicals are applied which are able to kill the plants in a few weeks of time. These chemicals usually called as herbicides effects the killings of plants in two ways. In one case, these herbicides block the photosynthetic activities of the plants and thus the plants are gradually killed in a couple of months. In another case, certain chemicals used as herbicides destroy the cells and tissues of the plants thus resulting of the gradual killing of the plants. Herbicides like Glyphosate (Glycin 41 %), Paraquat, 2-4 D (Disodium salt), Atrazine (Wettable powder) etc., when sprayed over the leaves of plants can kill the plants by blocking the photosynthetic activities. 1 % solution of sodium arsnate or arsnite in water can destroy the cells and tissues of plants when injected in the stem of plants.

In my experience, a spray of Glyphosate in the beginning and after a few weeks, injection of 1 % solution of sodium arsnate in water can be very effective in eradicating Peepal plants from the buildings and monuments. These chemicals are very toxic and hence only trained persons should handle these and while handling these chemicals, protective gears like mask, gloves, spectacles and apron should be wearied. Besides this after the work is over hand should be cleaned with soap and water. Accessories like spray-pump, drilling machine, syringe etc., would be required during operation. After the plants are dead, it should be carefully removed by dismantling certain portions of the monuments. After removal of plants the cracks and gaps should also be repaired along with the repair of the dismantled portions so as to prohibit further growth of plants.

Eradication of plants from Uma Maheshwor temple at Gabahal - A case study

In Uma Maheshwor temple at Gabahal, Patan, trees of Peepal, Bhimsenpati, other types of small herbs, Algae and Lichens were grown. There were a lot of cracks and gaps at a lot of places. Due to higher plant growth the temple was tilted in the eastern side. The conservation work was completed in about four months. In the beginning a photographic documentation was prepared. After that the work of scaffolding was completed. In the beginning a 1:1 solution of Glyphosate in water was sprayed over the entire plants. After a couple of weeks, a 3 % solution of sodium arsnate in water was injected in the stem of plants. When the plants were completely dead, certain portions of the eastern side of the temple was dismantled to uproot the plants and to correct the bulged layers. Before dismantling, the stone blocks were properly numbered. After removal of plants, the stone blocks were refixed using a special mortar. The preparation of mortar was carried out by mixing 1 kg slaked lime + 5 kg stone powder (not very fine but some grain type) + 100 gm dry Urad Dal (dry urad dal soacked overnight and then grind) + 100 gm PVA emulsion + 5 to 10 ml biocide and the color of this mortar was matched according to our requirements. The gaps and cracks were also filled with the same mortar. Algae and lichens were cleaned off using 1 % solution of ammonia and nonionic detergent. After the temple was completely dry a 4 % solution of repellin was applied as protective coating.

Conclusion: -Prevention is better than cure. Regular care and maintenance can reduce the chances of plant growth on monuments. To prevent the growth of plants on monuments and historic buildings, following preventive measures can be taken: -

(a) Regular cleaning of the monuments will ensure the removal of dead organic matter which is a good source of nutrients for the growth of plants.

(b) Higher plants generally grow in the cracks and cavities present on the monuments. Therefore repair of such cracks and cavities at the earliest will prevent higher plant growth.

(c) Water being an important factor in the growth of plants its scarcity will reduce the chances of plant growth. This can be achieved by controlling the dampness in the monuments.

Reference : -

(1) Dr. Agrawal O. P., A. K. Mishra, Kamal K. Jain: **Removal of plants and trees from historic buildings**, INTACH - Lucknow 1995.

Before Conservation

After Conservation

चपट टोल, पाटनको हारती (एकजटी)