Bio indicators

in the environment & how it changes over time. changes in the environment are often attributed to anthropogenic disturbance. e.g. pollution, land use changes & related stressors e.g. drought, heat, spring freeze. Although anthropogenic disasters from the primary focus of biomonitoring.

Depending on the organism selected and their use, there are several types of Bioindicators.

(A) Plant indicators
(B) Animal indicators & toxins
(C) Microbial indicators.
(D) Macro invertebrates.

(A) Plant indicators.

The presence & absence of certain plant & other vegetative life in an ecosystem can provide important clues about the health of the environment. There are several types of plant biomonitors including mosses, lichens, tree bark, bark pockets, tree rings, & leaves. Fungi too may be useful as indicators.

lichens are found on rocks & tree trunks & they respond to

Bio-indicators

environmental changes in forests, conservation biology, air quality & climate. SO_2, NO_2 may indicate the environmental stresses.

eg - Lobaria pulmonaria (Lichen) is sensitive to air pollution.

Lichens & bryophytes serve as effective bio-indicators of air quality because they have no roots, no cuticle and acquire all their nutrient from direct exposure to the atmosphere. Chlorella is used to monitor toxic substances in water bodies. Some algae such as Scenedesmus, Tenuicosta, Skeletonema costatum etc. used as indicators of oil pollution.

(B) Animal indicators & toxins

Changes in animal population, whether increases or decreases can indicate pollution. For example, if pollution causes depletion of a plant, animal species that depend on that plant will decline. The overgrowth of a species to loss of other species in an ecosystem.

Amphibians (Frogs & Toads) are increasingly used as bio indicators of contaminant accumulation in pollution studies. Anurans absorbs toxic chemicals through their skin & larval gill membrane & are sensitive to alteration in their environment.

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(D) Microbial indicators:-

Microorganisms can be used as indicators of aquatic & terrestrial ecosystem health.

Some microorganisms will produce new proteins called stress proteins. when exposed to contaminants such as Cadmium & Benzene. These stress proteins can be used as an early warning system to detect changes in levels of pollution.

MPOG (Microbial prospecting for oil & gas) is often used to identify Prospective areas for oil & gas occurrence. In many cases, oil & gas is known to seep toward the surface as a hydrocarbon reservoir will usually leak & have leaked towards the surface through buoyance forces overcoming sealing pressure. These hydrocarbons can alter the chemical & microbial occurrence found in the near surface soils. Techniques used for MPOG include DNA analysis.

Microalgae - gained attention for greater sensitivity to pollution. Euglena gracilis is a motile, fresh water photosynthetic algae flagellate. It indicates heavy metals & inorganic & organic compounds

(2) Macroinvertebrates:

Macroinvertebrates are useful & convenient indicators of ecological health of water bodies & terrestrial ecosystems. Individual species or whole community provide data on accumulation of chemicals in animals. Accumulation occurs to different extents & in different organs. Accumulation of chemical within food chain and high levels of toxicity in human food stuffs are indicated by selecting a suitable species for routine body.

Fish, Daphnia, Silver carp etc are used to monitor heavy metal and Pesticide Pollution levels in water. Zooplanktons such as rotifers and Cladocerans are used as indicators of freshwaters. Earth worms are good bio-indicators of soil radioactive Pollution.

Despite of above bioindicators, Some other species such as aerodiagnosis (flora and fauna), Human System and Cell biology, genetics and Comparative Physiology are involved in

Air is medium of transport of flying animals, germs of infectious diseases, plant and animal parts, fungal spores, pollen grains etc. The monitoring of airborne pollen & spores and related micro phytoplankton, algal filaments, insects scales & wings has received special attention of aerobiologists, mainly causing an human allergy and plant pathogenicity. Pollen grains are pollutants causing biopollution. Pollen grains are considered as omnipresent & thus good bioindicators in monitoring programmes. Nair (1985) presented an account of biomonitoring of airborne plant material.

Cellular and sub cellular components, even chromosomes adapted to specific environmental condition, form an excellent parameter for bioindicator. Both short and long term test-system have been developed in-vitro and in vivo to monitor changes caused by different environmental agents. Grover et al. (1985) presented an account of monitoring environmental chemicals by chromosomal aberrations in plants.

Many animals show behavioural responses following the detection of environmental changes by their sense organs. A chemical may influence the functioning of endocrine, nervous, muscular, cardiovascular and excretory system. Such changes may be investigated at morphological, biochemical & physiological levels and can indicate the presence of toxic substances.