Vetiver system ecotechnology

In a meeting report[1], Lavania *et al.* mention the use of vetiver as a traditional practice. I would like to invite the attention of readers to two Sanskrit manuscripts, Surapala's *Vrikshayurveda*[2] (c. AD 1000) and Chakrapani Mishra's *Vishvavallabha*[3] (AD 1577) in which reference to the use of vetiver, along with other herbals, has been made. Vishvavallabha[3], chapter 2, verse 37, states 'putting the powder of *ushira* (vetiver) (and others – author) in wells or other water reservoirs, turbid, bitter, or foul smelling water can be turned into tasty, clean, and sweet-smelling water'.

1. Lavania, U. C., Lavania, S. and Vimala, Y., *Curr. Sci.*, 2004, **86**, 11–14.
2. Sadhale, Nalini (Tr.), *Bull.*, **1**, Asian Agri-History Foundation, Secunderabad, India, 1996, p. 60.
3. Sadhale, Nalini (Tr.), *Bull.*, **5**, Asian Agri-History Foundation, Secunderabad, India, 2004, p. 69.

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Assessment of species rarity

The meagre availability of data on the population and quantum of rare species in nature has restricted their categorization in the *Red Data Book* on the basis of herbarium collections rather than population estimation in the wild, and the assessment of a few species tabulated before the few experts in the Conservation Assessment and Management Plan (CAMP) Workshops according to the new IUCN approach, are the major shortcomings in assigning a threat category to any rare species[1].

The problems in the assessment of the rare plants aggravated in the mountainous region, especially to the high altitude areas due to toughness and inaccessibility of the terrain, inhospitable climatic conditions, and limited period for survey due to the short life cycle of plant species growing in such elevations. Most of the available data are collected from the easily accessible areas in the mountainous region, which are also raided for collection of medicinal plants by indigenous communities and commercial herb gatherers. Therefore, the estimated population density of categorized, rare medicinal plants is not precise, as it would differ from the areas that have never and hardly undergone any collection of such rare medicinal plant species.

To verify the present categories of rare plants assigned by IUCN to the Himalayan medicinal plants, I selected three species, viz. *Dactylorhiza hatagirea* (critically endangered), *Picrorhiza kurrooa* (endangered) and *Rheum moorcroftianum* (vulnerable) (Figures 1 and 2). All these three species have a restricted distribution range and thus they only grow in the alpine meadows of the Himalaya. This fact helps in extrapolating the estimated values for the selected species to the whole alpine meadows. I extensively surveyed these species in three Himalayan states of North West–Himalaya in India – Uttaranchal, Himachal Pradesh and Jammu–Kashmir. More than 500 quadrats of 1×1 m were laid down in the alpine meadows of each state and the individuals of the selected species were enumerated in each quadrat.

The above and below ground biomass of these three species was quantified following ref. 2. The calculated density of each medicinal plant extrapolated for the geographical area, falls in the alpine meadow of the selected state. The average biomass (dry weight) determined for an individual, using 10 replicates at each site, was multiplied with the total number of individuals of the selected species for quantifying the available total biomass.

The results reveal that the total annual production of *D. hatagirea*, *P. kurrooa* and *R. moorcroftianum* is approximately 19,250, 32,560 and 3,165,980 tonnes respectively in North West Himalaya. In total, Jammu–Kashmir obtains the highest quantity of these species, followed by Himachal Pradesh and Uttaranchal (Table 1). The available biomass of these species in nature shows that proportionately critically endangered species obtain

Figure 1. A critically endangered medicinal orchid of the Himalaya, *Dactylorhiza hatagirea* (Photo: C. P. Kala).

Figure 2. An endangered medicinal plant of the Himalaya, *Picrorhiza kurrooa* (Photo: S. K. Singh)

Table 1. Biomass (dry weight in tonnes) of selected rare species across three States of India in North-West Himalaya

Species	Biomass per individual (kg)	Biomass in Uttaranchal (tonnes)	Biomass in Himachal Pradesh (tonnes)	Biomass in Jammu–Kashmir (tonnes)	Total biomass in North–West Himalaya (tonnes)
Dactylorhiza hatagirea	0.0011	3,360	2,000	13,870	19,250
Picrorhiza kurrooa	0.0017	5,690	3,390	23,470	32,560
Rheum moorcroftianum	0.1500	5,53,630	3,30,330	2,282,020	3,165,980

lesser quantity than the rest of the two categories – endangered and vulnerable.

There is a wide gap between the supply and demand of these species. From the North-West Himalaya (the present study region), the annual supply of *D. hatagirea* and *P. kurrooa*, for example, is about 100 tonnes for each species. Yet, the annual demand of *D. hatagirea* and *P. kurrooa* is 5000 tonnes for each species[3]. This variation in demand and supply is not due to low availability of these species in the wild but due to heavy collection of these species from some accessible areas and at the same time no collection from the remaining large areas. The areas used for collection have also been studied for population density in the wild, thus disseminating the false information on its availability in the wild which is used for placing the species in a respective threat category.

According to the IUCN Red List categories, a taxon is critically endangered when it is facing an extremely high risk of extinction and obtains less than 250 mature individuals in the wild. Similarly, a taxon placed in the endangered category may obtain less than 2500 mature individuals. The present study estimates about 0.56×10^{12} and 0.61×10^{12} individuals of *D. hatagirea* and *P. kurrooa* respectively. The demand of these species is, of course, high but the availability in the wild does not reflect that *D. hatagirea* should be ranked as critically endangered and *P. kurrooa* as endangered.

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2. Singh, J. S. and Yadav, P. S., *Ecol. Monogr.*, 1974, **44**, 351–376.
3. Mishra, M. K., Proceedings of the International Conference on Medicinal Plants for Survival, IDRC-CRDI, Bangalore, 1998, pp. 142–157.

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MEETING REPORTS

Green pesticides for insect pest management*

Agriculture in a tropical country like India, owing to its climatic conditions and its particular environment, suffers severe losses due to pests. The Indian farmers are in need of effective tools to fight against pests. After severe setback arising from the use of chemical pesticides on living systems and the environment, the use of eco-friendly biopesticides is gaining momentum. However, the small farmers in India are not yet fully aware of the concept, use or advantages of eco-friendly pest management. Though India has a rich source of plants that could be harnessed as botanical pesticides, accentuated research on the preparation of biopesticides has not gained ground.

Botanical pesticides are good alternatives to chemical pesticides. Botanical pesticides are eco-friendly, economic, target-specific and biodegradable. For example, neem-based botanical pesticides have been used traditionally for many years. There are many other trees (besides herbs and shrubs) which are also useful as sources of botanical pesticides (Table 1). To enlighten and encourage research in botanical pesticides, the Entomology Research Institute, Loyola College, Chennai, organized a two-day National Symposium on 'Green Pesticides for Insect Pest Management' during 5–6 February 2004. Discussions during the symposium covered areas of botanical pesticides, microbial agents, contributions of biotechnology, pheromones, host plant resistance (HPR), entomophages, traditional green pesticides and Integrated Pest Management (IPM). Rabindra (Project Directorate of Biological Control, Bangalore) in his inaugural address, stated that only 20% of the IPM is adopted in the field. He stressed the ill-effects of chemical pesticides and fertilizers and the role of botanical pesticides in sustainable agriculture. He stated that actinomycetes are completely absent in Andhra Pradesh and Karnataka due to indiscriminate use of chemical fertilizers. He pointed out the efficacy of neem formulations in the control of sucking pests, but also cautioned that botanicals are not the only solution. Also, he explained the merits and demerits of microbial pesticides and elaborated on the need for increasing awareness among farmers, low-cost production of microbial pesticides,

*A report on the National Symposium on Green Pesticides for Insect Pest Management conducted at Entomology Research Institute, Loyola College, Chennai, during 5–6 February 2004.