Review of the PhD thesis

Maan Bahadur Rokaya

Diversity, distribution and conservation of medicinal plants in Nepal

Maan Rokaya has submitted a comprehensive PhD thesis attempting to synthesize different aspects of medicinal plants in Nepal. The thesis consists generally of two parts. The first is the synthetic part unifying the individual studies (General introduction, Aims of the Thesis, General conclusions, English and Czech summary). The core of the thesis is formed by seven standard research reports written in high-quality English, i.e. papers published, accepted or submitted to international journals – two published, two submitted, and three prepared for submission. In all the research reports except for one, Maan Rokaya is the first author. I am convinced that also the two submitted reports and those in preparation will be finally accepted in some international journal. Taken together, Maan Rokaya demonstrated his ability to carry out an independent research, to analyze the data, to draw conclusion from the data, and finally, to finish the work by writing a scientific report for an international journal. I have no doubts about the sufficiency of this thesis for obtaining the PhD degree.

The thesis deals with an important and interesting topic of use and conservation of medicinal plants in Nepal, which is of tremendous importance for local people. What I appreciate most on the thesis is an attempt to see whole issue in a complex way, from large-scale comparison of diversity and distribution of medicinal plants in entire Nepal up to detail population studies of widely used *Rheum* species with the aim of finding suitable harvesting strategies and possibilities of domestication. I would also like to stress that the author employed a large body of different statistical approaches for data evaluation including randomization tests, population matrix modeling, and multivariate ordination methods. Although I red all the papers, I feel that it is worth focusing only on a limited set of my comments and questions (considering the length of the thesis and the number of reviewers):

Since I am currently doing own research on diversity and adaptations of high-altitude plants (many of them used for medicinal purposes) in dry mountains of NW Himalayas, I like very much the first paper dealing with the altitudinal distribution of medicinal plants in Nepal, using an appropriate randomization tests, and interpreting the results in the light of two prominent hypotheses: Rapoport's rule and mid-domain effect. Author states that the species richness of medicinal plants is higher in central and east Nepal and lowest in west Nepal because of drier climate, but if we look at the graph (Appendix 1) we see that this is valid up to the elevation of 2000 m; however, above this altitude the species richness of medicinal plants is much higher is west Nepal than east Nepal. Do you have some explanation for this pattern?

The paper 3 tells us in comprehensive way about the importance of rhubarb *Rheum australe* as medical system for treating wide range of ailments. This and the following papers conclude that wild populations of *Rheum australe* are highly threatened by over-harvesting for trade and hence some rescue cultivations are necessary. Are there any ongoing domestication projects for mass rhubarb production in Nepal or India and if yes how successful are?

In the paper 4, seed germination experiment for two Himalayan rhubarb species has shown the importance of light and higher temperature for successful germination. As both species have centre of distribution at higher altitudes of **dry environments**, what do you think about the role of varying soil moisture conditions for seed germination? From our experience in dry mountains of Transhimalaya (where three rhubarb species occupy dry rocky slopes and screes with < 100 mm rainfall annually), it is an occasional surplus of precipitation in summer that might stimulate germination rather than temperature and light. Perhaps in Nepal, the environment is never so dry to markedly limit rhubarb germination.

In the last paper 7 dealing with the impact of invasive species *Parthenium hysterophus* on meadow vegetation in Nepal it is stated that specimen of all plant species encountered during the field sampling were identified with the help of standard literature. But when we look at the list of species in Table 1, out of 45 species found, 21 species were identified to genus level only. Then, for all plant species, the author obtained some traits from available databases. In assigning traits to species, how did you cope with unidentified species for which you have only information about genus identity? I imagine that some traits like plant height or perenniality might have been easily obtained during the fieldwork but this is not stated in the text.

In some chapters it is visible that more time will be needed to make the text ready for final submission (for example on page 10 of the paper 6 dealing with population growth rates of rhubarb species)

Finally, I would like also stress that the thesis reflects only the “hard scientific” part of Maan Rokaya’s publication activity. Otherwise, he has published several other botanical publications in more local journals.

In conclusion, Maan Rokaya clearly demonstrated his ability to carry out an independent scientific work, and present its results to a wide international scientific community, and also, to draw from his results conclusions that can have direct management consequences. I have no doubts that he should be, after successful defense, awarded the PhD title.

České Budějovice, November 3rd, 2011 Jiří Doležal