Introduction: Medicinal Rhodiola species, including Rhodiola rosea L. and Rhodiola crenulata (Hongjingtian  红景天) have been widely used as herbal medicines with numerous claims for their therapeutic effects. These products are registered by a number as pharmaceuticals and throughout China Rhodiola is also taken for wellness and is registered a self-medicated wellness product for ‘blood-boosting and heart-strengthening.’ However other species exist that may be found as adulterants in the value chain, these include Rhodiola quadrifida (Pall.) Fisch. & C.A.Mey, Rhodiola sachalinensis Boris, and Rhodiola fastigiata (Hook. f. & Thomson) S.H. Fu. Faced with resource depletion, environment destruction and higher demand, R. rosea and R. crenulata are becoming scarce around the world. This scarcity may add to their economic value, but also increases the risk of adulteration and poor quality (Booker et al. 2015).

Results:

30% of the Rhodiola samples collected from the market were neither R. rosea or R. crenulata. Some R. rosea samples were also being sold as R. crenulata. 47.7% of raw material samples were not labelled properly and their species information were not clearly illustrated to customers. This highlights the lack of proper local government policies and good quality control strategies. According to our study, different Rhodiola species (including R. rosea and R. crenulata) can be found in the Chinese market. However, they are neither sold separately nor well identified. Therefore, there is a high potential of adulteration and substitution among these species.

Conclusion: This study provided a method for distinguishing five different species of Rhodiola. The metabolomic and phytochemical differences between these different species has been demonstrated through NMR spectroscopy and HPTLC analysis. DNA barcoding could also distinguish these species, and specific PCR tests were able to discriminate individual Rhodiola species from potential adulterants. There is a need to study the links between producers and consumers especially when in trans-national trade and re-enforce the hypothesis that poor quality and adulterated products can be products of poorly governed value chains, particularly at the early stages of supply. Moreover, it can be argued that through the establishment of well-controlled and well managed value chains it is possible to better prevent accidental or deliberate contamination and adulteration from occurring.

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