

A classical genetic solution to enhance the biosynthesis of anticancer phytochemicals in *Andrographis paniculata* nees

Abstract

Andrographolides, the diterpene lactones, are major bioactive phytochemicals which could be found in different parts of the medicinal herb *Andrographis paniculata*. A number of such compounds namely andrographolide (AG), neoandrographolide (NAG), and 14-deoxy-11,12-didehydroandrographolide (DDAG) have already attracted a great deal of attention due to their potential therapeutic effects in hard-to-treat diseases such as cancers and HIV. Recently, they have also been considered as substrates for the discovery of novel pharmaceutical compounds. Nevertheless, there is still a huge gap in knowledge on the genetic pattern of the biosynthesis of these bioactive compounds. Hence, the present study aimed to investigate the genetic mechanisms controlling the biosynthesis of these phytochemicals using a diallel analysis. The high performance liquid chromatography analysis of the three andrographolides in 210 F1 progenies confirmed that the biosynthesis of these andrographolides was considerably increased via intraspecific hybridization. The results revealed high, moderate and low heterosis for DDAG, AG and NAG, respectively. Furthermore, the preponderance of non-additive gene actions was affirmed in the enhancement of the three andrographolides contents. The consequence of this type of gene action was the occurrence of high broad-sense and low narrow-sense heritabilities for the above mentioned andrographolides. The prevalence of non-additive gene action suggests the suitability of heterosis breeding and hybrid seed production as a preferred option to produce new plant varieties with higher andrographolide contents using the wild accessions of *A. paniculata*. Moreover, from an evolutionary point of view, the occurrence of population bottlenecks in the Malaysian accessions of *A. paniculata* was unveiled by observing a low level of additive genetic variance (VA) for all the andrographolides.

Keyword: *Andrographis paniculata*; Andrographolides; Anticancer