Understory light and root ginsenosides in American ginseng cultivated in a broadleaf forest

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Introduction

The medicinal properties of American ginseng (*Panax quinquefolius* L.) are attributed to its ginsenoside concentration. Previous studies revealed that Asian ginseng plants grown under artificial shade and exposed to high light intensities contained higher root ginsenoside concentrations than plants exposed to low light levels. However, the influence of forest understory light levels on the root ginsenoside concentration remains poorly documented.

Results

† Generally, the root ginsenoside concentration increased with time (Fig. 1),

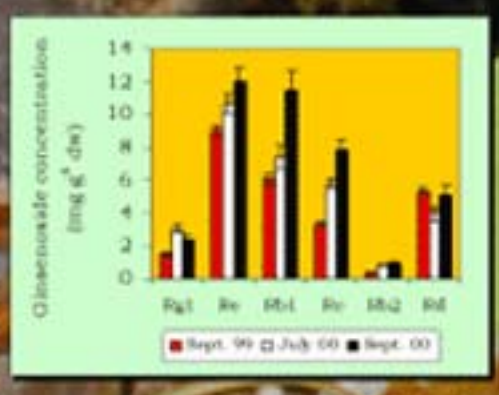

Figure 1 Concentration of each ginsenoside in one- and two-year-old ginseng roots.

† The total light levels and the duration of sunflecks decreased dramatically during the month May and then stabilised thereafter (Fig. 2).

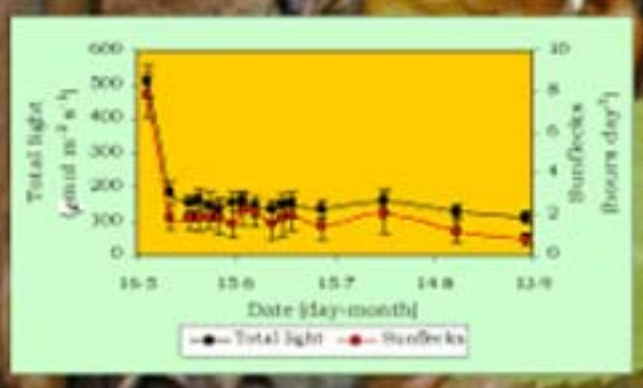

Figure 2 Total light levels and the duration of sunflecks in the understory of a broadleaf forest.

† The one- and two-year-old ginseng plants exposed to the highest total light levels (333 and 276 ?mol m^{-2} s^{-1} respectively) contained 48% and 68% more total ginsenosides in their roots than those grown under the lowest total light levels (119 and 173 ?mol m^{-2} s^{-1} respectively).

† The total ginsenoside concentration in one- (Figure 3 A,B,C) and two-year-old (Figure 3 D,E,F) ginseng roots collected in September was significantly related to the direct light levels and the duration of sunflecks, but not to the diffuse light levels.

Figure 3 A,B,C Regressional analyses (r^2) between daily direct and diffuse light levels (mol m^{-2} d^{-1}) and sunfleck duration (hours d^{-1}) in relation to the total ginsenoside concentration (mg g^{-1} dw) in one-year-old American ginseng roots.

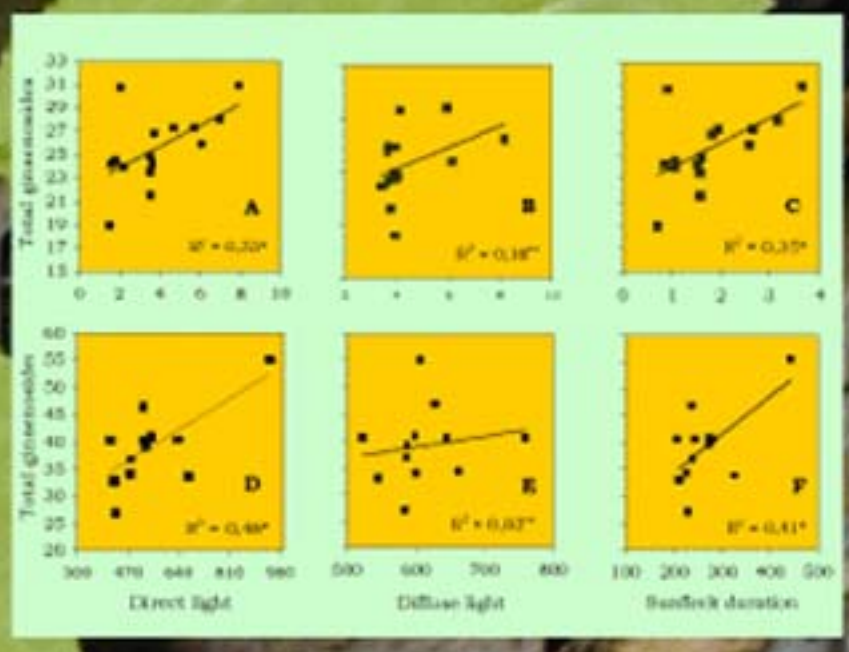

Figure 3 D,E,F Regressional analyses (r^2) between cumulative direct and diffuse light levels (mol m^{-2}) and duration of sunflecks (hours) during the growing season in relation to the total ginsenoside concentration (mg g^{-1} dw) in two-year-old American ginseng roots.

Discussion

Our results showed that American ginseng roots cultivated under elevated light levels contained high ginsenoside concentrations that not only augments their medicinal value, but also contributes to the plant's ability to combat pathogenic attacks. The high ginsenoside concentration in forest-cultivated ginseng roots is largely caused by the presence of sunflecks penetrating through the canopy.

Acknowledgements

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