

Ashwagandha Withanolides Promote Muscle Cell Differentiation: Application for sports supplement

SATテクノロジー・ショーケース2022

■ はじめに

Ashwagandha (*Withania somnifera*) is used in Indian traditional medicine, Ayurveda, and is believed to have a variety of health-promoting effects. Several studies have reported the clinical efficacy of Ashwagandha extracts for management of body fat and muscles, improvement of brain function and adaptation to stress. However, the molecular mechanisms and pathways underlying muscle differentiation have not yet been sufficiently explored. In this study, we used C2C12 myoblasts and investigated their differentiation potential and stress tolerance in response to the treatment with Ashwagandha extracts and the major withanolides, withaferin A (Wi-A) and withanone (Wi-N).

■ 活動内容

C2C12 cells were treated with the non-toxic doses of Ashwagandha extracts and the purified Wi-A and Wi-N. Differentiation of myoblasts to myotubes was monitored visually in a time dependent manner. Control and differentiated cells were subjected to biochemical and imaging analyses for proteins involved in differentiation, hypoxia, stress and autophagy signalings. The analyses of protective effect on heat and metal stress induced aggregated proteins was carried by heat-induced luciferase folding assay and protein aggregation and de-aggregation assay, respectively. Ashwagandha extracts possessing different ratio of Wi-A and Wi-N, when supplemented in C2C12 cell culture medium, resulted in their differentiation into myotubes. Of note, Wi-N and the extracts with low content of major withanolides (Wi-A+Wi-N; 0.05 to 0.1 μ M) and high ratio of Wi-N:Wi-A (3 to 5) induced stronger differentiation and was marked by expression of proteins involved in muscle differentiation (Fig.1). Wi-N and Wi-N rich extracts caused stronger differentiation of myoblasts to myotubes, deaggregation of heat- and metal-stress-induced aggregated proteins, and activation of hypoxia and autophagy pathways. These results demonstrate the potential of Ashwagandha withanolides for the management of muscle repair and activity (Fig.2).

■ 関連情報等(特許関係、施設)

Jia Wang, Huayue Zhang, Ashish Kaul, Kejuan Li, Didik Priyandoko, Sunil C. Kaul, Renu Wadhwa. Effect of Ashwagandha withanolides on muscle cell differentiation. *Biomolecules* 2021, 11(10):1454.

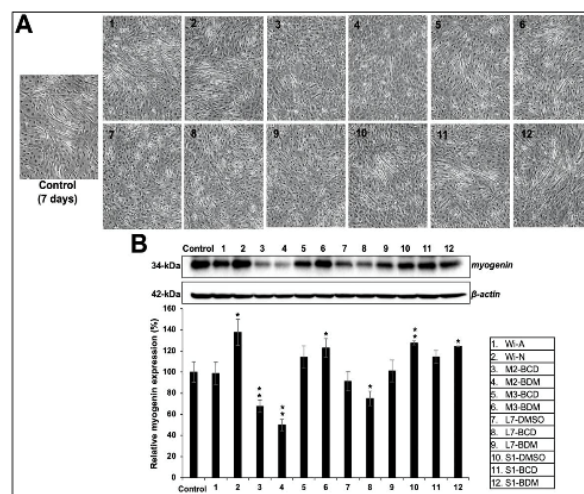


Fig. 1 Effect of Ashwagandha extracts and purified withanolides on differentiation in C2C12 cells. (A) Phase contrast microscopic images showing the cell morphology and appearance of myotubes in control and treated cells. (B) Western blotting analysis for myogenin protein (master regulator and biomarker for muscle cell differentiation) after incubation of Ashwagandha withanolides.

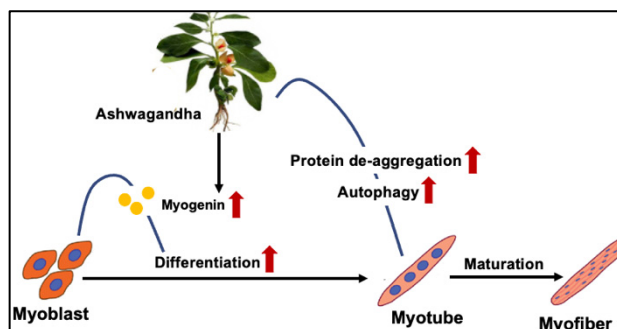


Fig. 2 Potential of Ashwagandha withanolides for management of muscle repair and activity.

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■キーワード: (1) Ashwagandha
(2) Muscle differentiation
(3) Protein aggregation