**Beneficial Effects of selected herbal extracts on metabolic master switches – Determination of the potential activation of AMPK**

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**ABSTRACT**

Type 2 diabetes mellitus is a common metabolic disorder with high global prevalence. Over 350 million people worldwide have Type 2 diabetes and the International Diabetes Federation projects says that this number will increase to nearly 366 million by 2030. It is characterized by a decrease in insulin secretion, a decrease in insulin sensitivity or both. There is substantial evidence suggesting that either physiological or pharmacological activation of AMPK, a major cellular energy sensor and a master regulator of metabolic homeostasis, can improve insulin sensitivity and metabolic health. Several plant-based extracts have been suggested to modulate the activity of AMPK. The present study was carried out to investigate the AMP-activated protein kinase (AMPK) in HepG2 cells with these extracts: Passiflora, Garcinia mangostana, Psidium guajava L. and Azadirachta indica leaves (Neem).

Viability of cells treated with Passiflora and Psidium guajava L were nearly to 100% at all tested concentrations, but treatment with Gracina mangostana showed a decrease in cell viability at concentrations of 50, 100 and 200 µg/mL, while Azadirachta indica treatment also decreased cell viability at the same concentration, but to a lesser extent than seen with Mangostana treatment. The protein concentration determined by ELISA showed that there was no activation, but rather an inhibition of AMPK in cells treated with these four herbal extracts, because all these extracts didn’t cross the borderline of the control. The positive control metformin did not show much more activation in comparison to control. We conclude that these herbal extracts display an inhibitory effect on AMPK similar to that seen with dorsomorphin, which is an AMPK inhibitor.

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**INTRODUCTION**

Genus *Passiflora*, which comprises about 500 species of Passifloraceae family and some of their species have been used extensively in the traditional medicine in many countries. Nowadays, *Passiflora* species are extensively used as sedatives and anxioytics, also being exploited by the food, pharmacological and cosmetology industries [1]. *Garcinia mangostana* Linn known as the queen of fruits, which belongs to Guttiferae family. Traditionally, numerous parts of *G. mangostana* have been utilized to treat various ailments [2]. *Psidium guajava* Linn of the family Myrtaceae and from a biochemical point of view the fruits contain vitamin C, vitamin A, iron, calcium and phosphorus. The fruit of guava are five times richer in vitamin C than citrus fruit such as oranges [3]. *Azadirachta indica* is a member of the Mahogany family of Meliaceae, has attracted worldwide attention in recent years, owing to its wide range of medicinal properties [4].

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**RESULTS**

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<thead>
<tr>
<th>Concentration (µg/mL)</th>
<th>Cell viability [%]</th>
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<tr>
<td>0</td>
<td>100</td>
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<td>50</td>
<td>80</td>
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<td>100</td>
<td>60</td>
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<td>200</td>
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Figure 2: ATP assay determination of cell viability. Data are presented as mean of cell viability relative to 0.2% DMSO Control (CTR). Error bars represent standard deviation. Metformin (MET) was used as a positive control. Treatment conditions that are significantly different to CTR were marked with stars (* → p ≤ 0.05, ** → p ≤ 0.01, *** → p ≤ 0.001 and **** → p ≤ 0.0001).

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**CONCLUSION**

The protein concentration indicated that there was no activation, but an inhibition with these four herbal extracts. The herbal extracts actually showed an inhibitory effect like dorsomorphin. These results suggest that there are some effects of these extracts to HepG2 cell line, details of which require further investigation.

**REFERENCES**