Investigating the potential effects of olive leaf and ginger rhizome extracts on Diabetes and its complications in diabetes-induced rats

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Abstract

In the modern era, diabetes mellitus (DM) has become one of the most important diseases affecting human health. Many synthetic drugs have reached the market to manage diabetes mellitus and mitigate its complications. Such drugs vary in their mechanisms of action, safety profile, and efficacy. At the same time, many people all over the world are still seeking for and trying herbal preparations for management of DM.
One of the widely cultivated plants in Jordan and the Mediterranean region is the olive tree (*Olea europaea*). Many studies have demonstrated the potential therapeutic effect of olive leaves extract in DM. Another widely studied natural herb is ginger rhizome (*Zingiber officinale*), which also has a potentially positive antidiabetic effect.
In this study, we aim to investigate the effect of combination consisting of aqueous olive Leaves extract and aqueous ginger rhizomes extract on diabetes type 1 using different physiological markers. This *in-vivo* study was conducted on male and female of Wistar rats with induced diabetes type 1. Fifty- two Wistar rats, they were distributed into eight groups, forty rats from them, which were given 150 mg/kg alloxan as a single dose intraperitoneal after 16 hours fasting rats to induce diabetes type 1. Of these eight groups, there were 2 healthy groups. All extracts were given at a dose 500 mg/kg orally once a day and the insulin was given at a dose 6 IU/kg subcutaneously once a day. Anti-hyperglycemic effects of olive leaves aqueous extract, ginger rhizome aqueous extract, and their combination were tested *in-vivo* in alloxan-induced diabetic type 1 Wistar rats. The protective actions against certain DM complications (i.e. potential hepatotoxicity and potential nephrotoxicity) were investigated through measuring serum ALT and ALP, and serum creatinine levels, respectively. Firstly, regarding the one of of the main outcomes of the study was to test the effect of administration of the extracts on survival of the rats with induced DM. In this study, it was found that the diabetic group received the aqueous extracts of both plants with Insulin had an obvious lower mortality rate than other diabetic groups after 14 days of treatment. Results from the present study clearly demonstrated a significant hypoglycemic activity of the aqueous extracts of olive leaves, ginger rhizome, and their combination when given orally – with subcutaneous insulin – to alloxan-induced diabetic rats after one week of treatment ((122.2 mg/dL (±78.8), 109.0 mg/dL (±36.1) and 144.4 mg/dL (±102.2), respectively) ($p = 0.028$, 0.027 and 0.028 respectively). No statistically significant differences were found between each other or between them and the diabetic group that received insulin alone (132.3 mg/dL (±103.7)) ($p = 0.028$). The results showed that in general, insulin with the aqueous extracts of olive leaves, and combination of extracts of olive leaves and ginger rhizomes were able to notably decrease the serum levels of ALT for alloxan-induced diabetic rats, even if they were not statistically significant. Moreover, the aqueous extracts of olive leaves and combination of extracts of olive

leaves and ginger rhizomes were able to keep the serum levels of ALP within the normal range for
the diabetic group and healthy group respectively, even if they were not statistically significant.
Regarding the potential nephroprotective effect, the separate aqueous extracts of olive leaves and
ginger rhizome produced a significant reduction in the serum creatinine level ($p = 0.028$ and
0.028).
In summary, the combination of olive leaves and ginger rhizome aqueous extract with insulin
represents a potential supplementary treatment to manage DM and its complications. This
combination improved the mortality rate for diabetic rats, had a hepatoprotective effect, while the
two extracts separately have nephroprotective effect. Moreover, it is easy to be prepare and has
low in cost