2016

Conflicting reports on the role of the glycemic effect of Catha edulis (Khat) _ A systematic review and meta-analysis

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Abstract

Ethnopharmacological relevance

Traditionally, the leaves of Catha edulis Forsskal (Khat) are consumed by the people of Yemen primarily for its recreational effect, and secondarily, for achieving certain tasks. Additionally, Yemeni diabetics chew such leaves in the belief that this can control their elevated blood glucose level.

Aims

This review focuses on outlining the findings of studies that have been conducted to display the glycemic effect of Catha edulis, while trying to balance it with findings of the association of its chewing with the development of type 2 diabetes mellitus (DM).

Materials and methods

The search strategy adopted was based on a comprehensive research in Medline, PubMed, Web of Science, JSTOR, Scopus and Cochrane for articles, proceeding abstracts and theses to identify complete reports written in the English language about the glycemic effect of Catha edulis in humans and animals from 1976 to 2016. In addition, bibliographies were also reviewed to find additional reports not otherwise published. Thirty seven records were identified of which, 25 eligible studies were included in the meta-analysis using blood glucose as an outcome measurement. Studies were divided into four subgroups according to the experimental model, namely; non-diabetic animals, diabetic animals, non-diabetic humans and diabetic humans. The pooled mean difference (MD) of blood glucose between experimental and control were calculated using random effects model of the weighted mean difference of blood glucose with 95% confidence interval (CI). Heterogeneity between studies was tested using $I^2$ statistic and a value of $P<0.05$ was considered to indicate statistical significance.

Results

The scientific reports in the literature prevailed that the glycemic effect of Catha edulis were greatly conflicting with the majority of studies indicating that Catha edulis has a mild hypoglycemic effect. However, the meta-analysis indicted that the overall result showed an insignificant reduction in blood glucose (MD=−9.70, 95% CI: −22.17 to 2.76, $P=0.13$, with high heterogeneity between subgroups, $I^2=88.2\%$, $P<0.0001$). In addition, pooled
mean difference of blood glucose of non-diabetic animals, diabetic animals and non-diabetic humans showed an insignificant reduction in blood glucose (MD=−18.55, 95% CI: −39.55 to 2.50, P<0.08, MD=−52.13%, 95% CI: −108.24 to 3.99, P=0.07 and MD=−2.71%, 95% CI: −19.19 to −13.77, P=0.75) respectively. Conversely, a significant elevation in the pooled mean difference of blood glucose in diabetic humans was indicated (MD=67.18, 95% CI: 36.93–97.43, P<0.0001). The conflict shown in the glycemic effect of Catha edulis is thought to be cultivar-related, while demographic and epidemiological reports suggested that chewing Catha edulis might be a predisposing factor contributing to the development of type 2 DM.

Conclusion

It was difficult to draw a meaningful conclusion from both the systematic and the meta-analysis with respect to the glycemic effect of Catha edulis since the meta-analysis results were insignificant with high heterogeneity among subgroups and are greatly conflicting. The variation is most likely due to unadjusted experimental factors or is related to Catha edulis itself, such as the differences in the phytochemical composition. Therefore, it is highly recommended that further studies of the glycemic effect of the cultivar of Catha edulis being studied should come with the identification and quantification of phytochemical content so that a meaningful assessment can be made with regard to its hypoglycemic properties. In addition, well-controlled clinical studies should be conducted to confirm whether or not chewing Catha edulis is associated with the development of type 2 DM, since this would be a source of concern seeing that the plant is widely consumed in certain populations.

Graphical abstract

Keywords

Khat; Catha edulis; Cathinone; Diabetes mellitus; Glycemic effect; Meta-analysis

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