Investigation of Traditional Palestinian Medicinal Plant *Inula viscosa* as Potential Antimalarial Agent

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Introduction

Malaria is a life threatening parasitic disease which is prevalent mainly in developing countries; it is the main cause of global mortality and morbidity. Development and search of novel and effective antimalarial agents to overcome chloroquine resistance have become very important issue. Most antimalarial drugs target the erythrocytic stage of malaria infection, where hemozoin synthesis takes place; and is considered a crucial process for the parasite survival.

Aim

This research is aimed to develop new anti-malarial drugs from herbal origin to eliminate this dreadful disease. In this study light was shed on the activity of *Inula viscosa* ethanolic extract as potential anti-malarial drug in both *in-vitro* and with Plasmodium parasite culture.

Materials and Methods. Fresh wild leaves of *Inula viscosa from* Palestine , were used in this study. A semi-quantitative *in-vitro* method, based on the inhibition of ferriprotoporphyrin IX (FP) bio-mineralisation developed by Deharo *et al.* [Deharo E *et al*. *Exper. Parasitol*. 2002, **100**:252-256.], was used to study the potential antimalarial activity. Another study using Plasmodium parasite culture was also done.

Extraction of plant *components*

Dried leaves were grinded into powder, extraction was performed by soaking (1:10) (*wt/vol*) of dried plant leaves in 35% ethanol, left for about 24 hours at room temperature. The extract was then filtered using Whatman No 42 filter paper. The crude ethanol extract was obtained after the solvent was rotary evaporated at 60-80°C under reduced pressure, followed by lyophilization using a Labconco freeze drier until constant weight was obtained then stored at -20˚C until use.

Results: This study is the first to show the inhibitory effect of Palestinian *Inula viscosa* alcohol extracts on the formation of the β –hematin. It was found in this investigation that *I. viscosa* has a strong inhibitory effect similar to that of chloroquine in *in-vitro system* and also with Plasmodium parasite culture.

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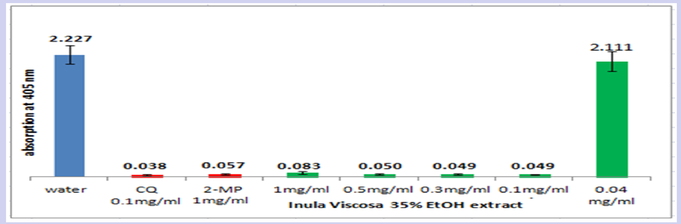

Figure 1: Column diagram representing the efficacy of potential anti-malarial drug 35% ethanol extract of *I. viscosa* leaves, compared to the control water and positive controls CQ-chloroquine 0.1mg/ml, 2MP-2mercaptopyrimidine1mg/ml, showing the absorption values of dissolved β-Hematin (alkaline hematin) at 405 nm using ELISA reader, according to E. Deharo semi-quantitative method. Each result represents the average of 24 individual experiments.

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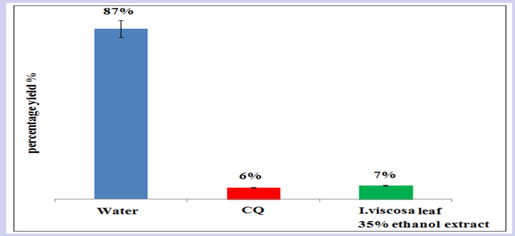

Figure 2: Column diagram representing the percentage yields of 35% ethanol extract of *Inula viscosa* leaves as potential anti-malarial drug, compared to CQ and water. Yields are inversely proportional to drugs efficiency. Each result is an average of 6 individual experiments. Concentration of Hemin chloride was 0.5mg/ml while the concentration of CQ and *inula viscosa* was 1.0mg/ml. .

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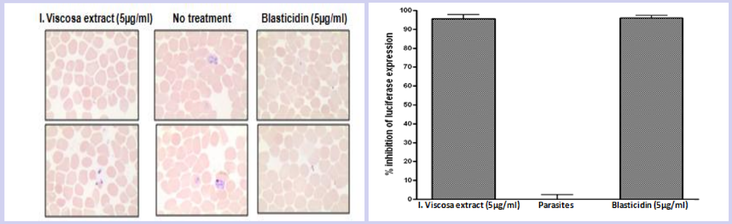

Figure 3: The effect of *Inula viscosa* leaves ethanol extract on *Plasmodium* cultured parasite. 5µg/ml of the plant extract was used compared to 5µg/ml of Blasticidin anti-malrial drug. .

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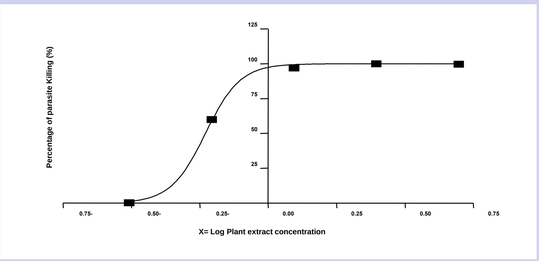

Figure 4: The maximum half effective drug concentration (EC50) calculation using different concentrations of *I. viscosa* leaves extract.

Conclusion: According to the results above, it is seen that the Palestinian flora *Inula viscosa* has a strong antimalarial activity in both *in-vitro* and Plasmodium parasite culture systems. Several secondary plant metabolites are responsible for this antimalarial activity. More attention must be given to this plant, further fractionation, purification and identification of possible active ingredients is currently under investigation, results will be published in the near future.

Acknowledgment

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