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Mosquito repellency with botanicals—a valuable means of preventing mosquito-borne diseases

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Dear Editor

The scientific reports on the repellent activity of various phytochemicals of different sources against *Aedes aegypti* (*Ae. aegypti*), *Anopheles stephensi* (*An. stephensi*) and *Culex quinquefasciatus* (*C. quinquefasciatus*) (Diptera: Culicidae) by different authors from different parts of the globe are timely, and their studies will help develop new formulations of cost effective natural agents in preventing mosquito bites as well as mosquito-borne diseases[1–3].

The mosquitoes belonging to the genus *Aedes*, *Anopheles* and *Culex* are of great public health concern, because they pose a direct health threat due to diseases (malaria, filariasis, dengue, chikungunya, etc.) transmitted by them, mainly in developing tropics and subtropics worldwide. Personal protection is an important approach to prevent mosquito bites and transmission of diseases vectored by mosquitoes to humans. The mosquito repellents are the key tools to prevent such frightful diseases (and also painful mosquito bites) to human hosts. Synthetic chemicals have been developed in order to protect humans from mosquito bites, and DEET (N, N-diethyl-m-toluamide), being a broad spectrum repellent, is the most effective one that persists for long time on the host body surface. However, the indiscriminate use of such deleterious synthetic chemicals causes environmental and human health risks on one side, and results emergence of mosquito populations showing resistance to these agents on the other. Many plant based products (plant extracts and essential oils) have been developed to solve the problems considering both the effectiveness of the repellents and their potential health hazards. A large number of plants have been reported to possess repellent activity against mosquito vectors, but *Azadirachta indica* (*A. indica*), *Eucalyptus* sp., *Lantana camara*, *Cymbopogon* spp., *Mentha piperita*, *Tagetes minuta* including few others products have been studied more extensively[4]. Tennyson *et al.*[3] reported that *Ageratum houstonianum* extract, in combination with coconut oil, provided 91.7%–93.4%, 88.5%–91.5% and 85.1%–95.0% protection to the laboratory reared albino mice against *An. stephensi*, *Ae. aegypti* and *C. quinquefasciatus* bites, respectively, with 10:30–11:30 a.m., 7:30–8:30 a.m. and 9:30–11:30 a.m. protection time, respectively. Gokulakrishnan *et al.*[2] reported that the patchouli alcohol, one of the *Pogostemon cablin* essential oil compounds, had most effective repellent activity with 100% protection up to 280 min, while up to 240 min for α -bulnesene and α -guaiene, and 160 min for β -patchoulene and γ -patchoulene against *Ae. aegypti*,

An. stephensi and *C. quinquefasciatus* bites. The protection time provided to the human volunteers, due to topical application of eight plants (*Cananga odorata*, *Syzygium aromaticum*, *Zingiber officinale*, *Cymbopogon citratus*, *Cymbopogon nardus*, *Eucalyptus citriodora*, *Citrus reticulata* and *Ocimum basilicum*) essential oils in combination with coconut oil, against the bite of *Ae. aegypti* were recorded as 54–96 min (0.9%–1.13% biting rate) and against *C. quinquefasciatus* as 54.00–112.50 min (0.90%–1.17% biting rate), as has been currently investigated by Sritabutra and Soonwera[1]. The repellent activity of *Eucalyptus* and *A. indica* seed oils have been reported against *C. quinquefasciatus*; there was zero bite for 120 and 180 min, respectively due to *Eucalyptus* and *A. indica* seed oils, and 100% protection against *C. quinquefasciatus* bite was achieved[5].

Finally, poor people in many rural areas cannot afford the expensive repellents; the use of indigenous plant based agents by them can provide a prophylactic means of protection in the community against mosquito bites and, hence, mosquito-borne diseases, especially in developing parts of the globe. In addition, it is important for the users to be aware of purported mosquito repelling products by checking whether the product has been studied scientifically.

Conflict of interest statement

I declare that I have no conflict of interest.

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