Table 1 *Effect of P. fraternus leaf and root extracts on the infectivity of viruses*

Virus	Plant part	Per cent inhibition*		
			Extract applied	
		Extract mixed with virus inoculum	24 hr before virus inoculation	24 hr after virus inoculation
TMV	Leaf	71	68	77
	Root	83	59	59
PGMV	Leaf	84	73	74
	Root	98	63	62
TRSV	Leaf	88	62	80
	Root	62	58	72

* average of three independent experiments.

modifying the test plants in establishing the virus infection. Verma *et al* tested the extracts of 17 medicinal plants on the infectivity of tobacco mosaic, sunhemp rosette, Gomphrena mosaic and tobacco ring spot viruses[4].

The inhibitory effect was not noticed when the crude sap of both leaves and roots was diluted to 1 : 50, and the percent inhibition decreased as the dilution increased with the tested viruses.

Temperature effect varied with the inhibitor source and virus. With PGMV the inhibitory effect of leaf extract was lost at 50°C, and of root extract at 70°C. Both extracts retained very little inhibitory effect even at 70°C against TMV and TRSV. The percent inhibition decreased as the temperature increased. These two physical properties support the presence of inhibitory agent in leaves and roots of *P. fraternus*. Further work is being carried on to characterize the active agent and its mode of action.

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A PHYSICAL METHOD FOR KILLING NOTONECTIDS IN NURSERY PONDS

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REARING of the spawn to fry stage in nursery ponds is affected by large scale predation due to aquatic insects, particularly the notonectids. The application of different types of emulsions[1-3] is effective to some extent in controlling the population of the air-breathing insects. But the technique cannot be employed during adverse weather conditions like strong wind and continuous rainfall and further, repeated use of chemicals in a delicate ecological system to check the repopulation of notonectids during the early stage of the rearing operation is not desirable. In the field it was observed that notonectids trapped in fry nets and unable to reach the water surface to respire were drowned in a few minutes. Hence, it was felt that some simple physical methods should be devised to check notonectids in small-sized nursery ponds without the ill-effects of chemical treatment.

Backswimmer (*Anisops* sp.) of two size groups 4–5 mm and 8–9 mm was collected from the nursery

ponds at the Fish Breeding Centre, Malampuzha. They were introduced in glass bottles, 25 cm high and containing 1 litre water. When the insect reached the surface and just breathed, the bottle was closed without air bubbles and the time was recorded. The time taken for death which is determined by the lack of response to physical stimuli and also the inability to recover when placed in contact with air was also noted.

Analysis of the data showed that the difference in the average time taken for death by the small (9.56 min) and large (9.92 min) size groups of animals was not statistically significant. Two to three minutes after introduction, the insect showed frantic effort to obtain air by striking at the top of the bottle and then started sinking to the bottom. There were occasional efforts to reach the surface which also ceased in 7–8 min and the animals died due to asphyxiation.

In the field, synthetic velon netting (1/12″ mesh) attached with sinkers and floats along strips was spread over the entire water surface of the nursery pond and allowed to remain for 11–12 min, killed all notonectids. The same technique was conveniently applied with success to kill and separate notonectids from fish fry, collected in containers for distribution. The physical method of eradication of notonectids has several advantages over the other conventional methods. In the chemical methods, the hydrocarbon component, particularly diesel used in emulsions is found to settle to the bottom and mix with soil, affecting soil fertility. Further, notonectids are found to repopulate the eradicated ponds from the neighbouring water bodies necessitating repeated applications of emulsions which are highly detrimental to pond productivity. However, the present method can be employed repeatedly even under adverse weather conditions and is devoid of any side effects. The technique is simple and can be effectively used in small nursery ponds without any recurring expenditure.

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SYNTHESIS OF SUBSTITUTED AMIDES FOR REPELLENCY AGAINST MOSQUITOES

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REPELLENTS play an important role in reducing the man-vector contact and therefore could help in interrupting the vector-borne disease transmissions. The repellent compounds (like dimethyl phthalate) that are available in the market are found to give a protection only for one or two hours. The other well-known repellent compound DEET[1,2] (N,N-Diethyl-m-toluamide) though is very effective, its prohibitive cost curtails its usage in countries like India and cannot be afforded by economically weaker sections of the society. Earlier reports[3–5] on the synthesis of substituted amides as mosquito repellents exist. In this paper, the synthesis and testing of thirty five substituted amides for repellency against the man biter *Aedes aegypti* is reported.

The acid chlorides of seven carboxylic acids, *viz* phenyl propionic acid, 2-chloro benzoic acid, 2,4-dichloro phenoxy acetic acid, 2-ethyl hexanoic acid, 4-ethoxy benzoic acid and 4-methoxy benzoic acid were prepared in relatively good yields by reacting the acid with thionyl chloride under reflux condition followed by removal of unreacted thionyl chloride and vacuum distillation.

The acid chloride was then reacted with different secondary amines like diethyl amine, dimethyl amine, piperidine, N-methyl aniline and N-ethyl aniline in dry ether at 5–10°C. The compounds were purified by either vacuum distillation or by crystallization. The purity of each compound was tested based on single spot in TLC and by IR spectral analysis.

The compounds were tested for repellency on animal model and on human skin following the methods outlined below:

Testing on Animal Model

Albino rabbits (30–40 day old) were used as experimental animals. The top surface (6.0 × 4.0 cm) on the animal skin was shaven and a solution of the test compound in alcohol was applied uniformly over that area at the rate of 1 mg/cm^2. The test animal (100 in number) was then placed inside a small circular animal