

### **A-33: The use of permethrin impregnated bed-nets**

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A trial of permethrin-impregnated bed-nets for malaria control is being carried out since June 1993 in 6 village units in Kataragama. A significant reduction in the malaria incidence following the use of impregnated bed-nets in this population, was previously reported. Entomological studies carried out

in the area during the study period, which reveal the impact of impregnated bed-nets on malaria vectors, and differences in impact on 2 potential vector species which transmit malaria in Sri Lanka, are now reported.

A population of 3964 resident in 6 village units in and around Kataragama in southern Sri Lanka where both *P.falciparum* and *P.vivax* are endemic was chosen for the study. Of the 6 village units, residents of 3 were supplied with bed-nets which were impregnated with 0.01 g/m<sup>2</sup> of permethrin at regular intervals of 7 months. Residents of the other 3 areas served as a control. The study commenced in October 1993.

Entomological studies commenced in November 1993 and continued till February 1995 on a monthly basis, in a single pair of test and control village units (Gonaganara and Walliammara). Entomological studies included indices of indoor prevalence of mosquitoes measured by means of pyrethrum spray sheet collections (PSC), exit trap collections, human biting rates of mosquitoes measured by indoor and outdoor human biting night collections, and outdoor prevalence of mosquitoes measured by cattle baited hut and net trap collections. Entomological studies were carried out on 6 alternate days of the month in each Village unit. Collected mosquitoes were identified and counted.

Mosquito densities were log transformed and analysed comparing test and control areas by species and method of collection.

The malaria incidence in this test village which used impregnated bed-nets was reduced by 81.45% compared to the incidence in the control village which had no bed-nets. There was a corresponding reduction in mosquito densities in the house and their immediate vicinity. There was a significant reduction in indoor resting density of mosquitoes in the test compared to control areas as indicated by a reduction in the PSC collections ( $p=0.034$ ), the indoor ( $p<0.001$ ) and outdoor ( $p=0.005$ ) human biting rates. The CBH&NT trap collections, however, did not show any differences between test and control villages for all mosquitoes, *Anopheles culicifacies* and *Anopheles subpictus* ( $p=0.105$ ,  $p=0.160$ , and  $p=0.974$ , respectively).

The 2 most prevalent species of Anopheline were *An.culicifacies* and *An.subpictus*. The reduction in indoor resting densities in the test compared to the control village was significant in *An.culicifacies* ( $p=0.002$ ) but not in *An.subpictus* ( $p=0.80$ ). Correspondingly, the exit traps in test villages had moderate densities of *An.subpictus* but hardly any *An.culicifacies*. These results indicate that the entry of *An.culicifacies* to households in the test villages was less than that of control village. Outdoor and indoor human biting rates were also significantly reduced in the test versus the control villages in *An.culicifacies* ( $p=0.001$  and  $p=0.001$  respectively) as compared to outdoor human biting rate of *An.subpictus* ( $p=0.314$ ).

These results indicated that the use of bed-nets affected indoor resting of *An.culicifacies* to a greater extent than *An.subpictus*. The reduction in malaria incidence in the test village in which impregnated bed-nets were used was thus, due in large part, to the reduction in densities of *An.culicifacies* in and around the households. This is consistent with *An.culicifacies* being the major vector of malaria in this region.

The results indicate that the effect of impregnated bed-nets is repellance of *An.culicifacies* from the house and their immediate vicinity, because the densities of *An.culicifacies* in CBN&H traps, which were located at a substantial distance from the houses were not different in the test and control villages.

All 5 varieties had the same firmness in mature green stage ( $4.5 \text{ kg cm}^{-2}$ ) but decreased to varying levels when ripe. The pH range reduced with ripening from 5-6 to 4-6 in all 5 varieties.

Treating with 0.2% acetic acid delayed ripening by 1-2 days and disease appearance by 3-4 days. Treating with an alkaline solution ( $\text{NaHCO}_3$ ) delayed ripening and disease appearance by 1 day.

Natural calcium level in the peel decreased from 261.9 to 203.4 ppm. However, treating with  $\text{CaCl}_2$  expedited disease appearance by 2 days significantly ( $p=0.05$ ). Ethanol which was expected to react with free carboxylic groups in pectin molecules of the peel did not affect ripening or disease development.

A firmer skin appeared to help resist anthracnose infection. As pH reduced with ripening, alkaline treatment was tried out. As disease appearance was expedited by this, acid treatment was done, which reduced diseases by about 40%. It is possible that the enzymes which degrade pectins get deactivated with acid treatment.

As ethanol treatment did not reduce diseases, it is possible that pectins in banana peels are highly methoxylated, and hence cannot respond to these treatments.

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