

ABSTRACT

The present studies describe the development of a genetic sexing strain (GSS) for the potent malaria vector *Anopheles arabiensis*- henceforth named 'ANO IPCL1', based on resistance to dieldrin. All aspects of this strain including its life history traits, the environmental impact resulting from its potential use, irradiation induced sterility, and its competitiveness in field-like conditions were examined and evaluated.

The retention of considerable levels of dieldrin residues were observed in the male insects after treatments. The transfer and bioaccumulation of these residues was subsequently demonstrated after feeding the treated adult mosquitoes to goldfish. Releasing sterile male mosquitoes containing dieldrin residues is considered unacceptable for use in area-wide control programmes. An alternative method of killing females using bloodmeals spiked with 7.5 ppm ivermectin was developed which eliminated >99% of adult females from a cage population of *An. arabiensis* by day 4 post emergence.

Both gamma- and X-ray irradiation were suitable for inducing high levels of sterility in males of this strain, with a dose of 75 Gy achieving 97% sterility. The males irradiated at this dose were approximately half as competitive compared to the wild-type strain in semi-field conditions. Sterile male to wild male release ratios of 10:1 induced 85% sterility in the field cage population in the F1 generation, giving an indication that a release ratio of at least this proportion could induce good levels of sterility in the target population.

Although the strain was very effective and reliable in terms of female elimination, and has shown to be relatively stable, there are several disadvantages- most notably the use of dieldrin and the environmental and health concerns surrounding this toxic and persistent organochlorine. The use of the strain therefore, was not recommended and the creation of novel strains based on other conditional lethal genes is highly recommended.

Keywords: sterile insect technique; genetic sexing; *Anopheles arabiensis*; ANO IPCL1; vector control