OLIVE FLY: FROM SMALL SCALE REARING TO LARGE SCALE MASS PRODUCTION

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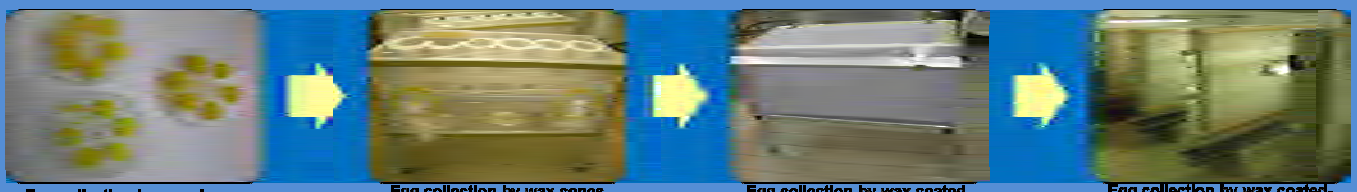
Introduction

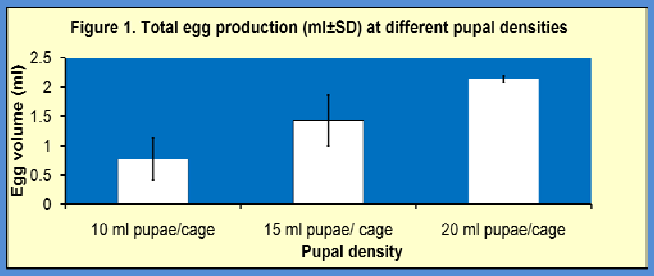
Considering the advantages of application of sterile insect technique (SIT) (Knipling, 1955), it is considered to be potentially very successful to control olive fruit fly, *Bactrocera oleae* (Rossi) (Diptera: Tephritidae), because of monophagous behaviour of this fly (Daane & Johnson, 2010). But limitations to apply SIT against olive fly include an inability to produce large numbers of flies (mass rearing). Despite of many attempts to develop mass-rearing methods, its colony size never increased to beyond laboratory rearing cages. The limitations for mass-rearing of this fly are low egg production rates, fungal contamination and a lack of knowledge of optimal growth-room environmental conditions. Traditionally egg collection was done using perforated plastic bottles or wax cones. Egg collection by these methods raised many problems such as difficulties in handling fungal growth caused by the presence of the damp sponge during egg seeding which was seen as essential in preventing egg desiccation. The objectives of this study were to improve the mass rearing of olive fruit fly by improving the egg collection method by simple procedures. Among various steps involved in improving the mass rearing, we will focus on the effect of cage design and fly density.

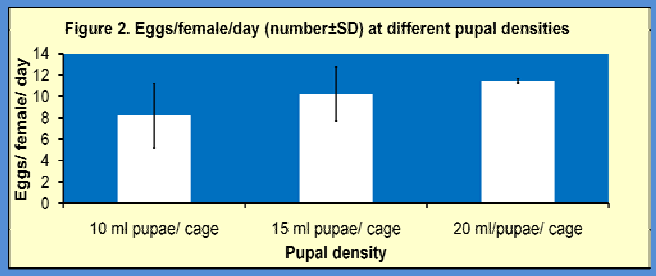


Egg collection by wax domes | Egg collection by wax cones | Egg collection by wax coated-cloth panel in a prototype cage | Egg collection by wax coated-cloth panel for mass-rearing

Materials and Methods

The olive fruit fly was reared at the Insect Pest Control Laboratory (IPCL), Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, Seibersdorf, Austria. The new cage designed at IPCL has flat panels of wax-coated cloth for egg collection covered by Plexiglas to preserve humidity inside. Initially the cage size used was 40cmx30cmx30cm. The wider side of the cage was cut resembling a photo frame and on this surface the wax-coated egging panel was set up for egg collection, on the other two sides cloth net panels were set up to allow air circulation. Pupal densities tested in 40cmx 30cmx 30cm cages were: 1) 10ml pupae/cage; 2) 15ml pupae/cage; and 3) 20ml pupae/cage. One ml volume of olive fly pupae contains ~80 pupae and the experiment was replicated three times. We also tested egg production from different cages ranging in volume from 0.015cm^3 to 0.4m^3.





Results and Discussion

Egg collection from the newly developed flat egging panel is easy, because the eggs, which are washed off the panel using a laboratory wash-bottle into a tray beneath, can easily be sieved from the water. The results showed that maximum egg production was achieved at pupal density of 20ml pupae per cage (Figure 1). Adult fly density of 4.1cm^2 (internal surface area of cage) per fly in a medium sized cage (40cmx30cmx30cm) gave optimal egg production per female (11.44 eggs/female) over the life of flies (Fig. 2). Egg production ranged from 2.8 eggs/female/day (0.17m^3 cages at 3.04 cm^3/fly) to 6.8 eggs/female/day from cages of different volume ranging from 0.015m^3 to 0.4m^3.

Conclusion

Due to the improved method of egg collection and optimal fly density, we have been able to upgrade the colony and we are able to mass-rear olive flies cost-effectively in large Mediterranean fruit fly cages.

References

Daane, K.M. & Johnson, M.W., 2010. Olive fruit fly: Managing an ancient pest in modern times. Annual Review of Entomology, 55, 151-169.
Knipling, E.F., 1955. Possibilities of insect control or eradication through the use of sexually sterile males. Journal of Economic Entomology 48, 459-462.