POTENTIAL OF SOME CULTURAL LEVERS FOR FRUIT FLY MANAGEMENT ON MANGO IN RÉUNION

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Background/Rationale

In Réunion, mango (*Mangifera indica* L.) is the 4th fruit crop, produced by *ca* 80 growers on *ca* 300 ha, with a mean annual production of *ca* 3000 T. Fruit flies (FF) (Diptera: Tephritidae) are major mango pests. On the other hand, mango growers are challenged to produce "more", notably via the reduction of crop losses due to pests and diseases, and "better", via fruit quality improvement and reduction of the adverse environmental impacts of pesticide applications. Many studies worldwide have shown that fruit maturity state was a key factor of mango infestation by FF ([**1**]; [**2**]; [**3**]; [**4**]).

Similarly, the potential of prophylactic harvest / destruction of fallen small mango fruits during early fruit drop as a lever for *Bactrocera* spp FF control has been highlighted ([**4**]; [**5**]; [**6**]).

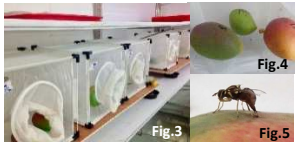
Harvest stage optimization and prophylactic elimination of early infestation sources were therefore assessed from 2015-2020, on "Cogshall" mango cultivar, both before and after detection of the invasive oriental FF *Bactrocera dorsalis* in the island, in 2017.

Methods

1. Several mango fruits were sampled in 3 orchards in 2015/16 & 2016/17 (**Fig.1**), and visually ascribed to a maturity stage [green (G); turning (T); yellow point (YP), with 3 sub-classes, YP1 (25%), YP2 (50%) & YP3 (75%); mature (M); overmature (OM), the latter from 2015-17 only (**Fig.2**)]. Their infestation level (pupa count) was recorded after a 3-week incubation period at *ca* 25°C in paper bags partly filled with river sand at the bottom. The study was repeated in 2 of the orchards in 2019/20, *ca* 2 years after *B. dorsalis* was first detected on the Island.
2. Multiple choice laboratory tests were conducted on protected mangoes, as described elsewhere for the 71 cages with *B. zonata* females that were evaluated from 2015-17 (**[7]; Figs 3-5**). 59 cages with *B. dorsalis* females were conducted the same way from 2018-20.
3. Observations were conducted on small mango fruits during early fruit drop (i.e. *ca* 2-4 weeks after fruit set: **Fig.6**) in 2018 and 2019, either according to fruit physiological stage (both on the tree and on the ground), or on the ground, according to type of ground cover [bare ground (**Fig.7**), high resident vegetation (**Fig.8**), woven plastic (**Fig.9**)].

Fig.1

Fig.2



Results

1. From 2015-17, fruits were mainly infested by *B. zonata* (92%), followed by *Ceratitis* spp. From 2018-20, they were infested exclusively by *B. dorsalis*. Fruit infestation increased significantly with fruit maturity: Yellow Point and ripe fruits were more infested than green fruits (**Fig.10**).
2. Under artificial infestation with *B. dorsalis*, the same trend was observed as with *B. zonata* ([**7**]), and as under natural infestation (cf. **Fig.10**), but differences between maturity stages were less conspicuous (**Fig.11**).

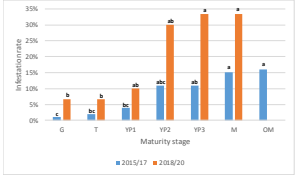


Fig.10. Mango infestation under natural FF pressure according to fruit maturity stage

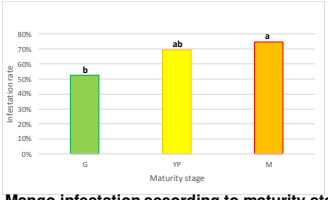


Fig.11. Mango infestation according to maturity stage after artificial infestation with *B. dorsalis*

3. Small green growing mango fruits on the tree were barely infested, whereas those close to abscission and those fallen on the ground sustained heavy infestation rates (**Fig.12**). Infestation of these fruits was lower on a woven plastic cover than on bare soil or resident vegetation-covered soil (**Fig.13**). Parasitism by micro-wasps was anecdotal at that stage.

Fig.12. Mango small fruit infestation by FF according to physiological status at the time of early fruit drop

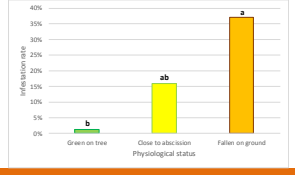
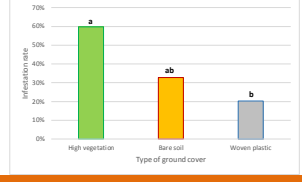


Fig.13. Mango small fallen fruit infestation by FF according to type of ground soil cover



Conclusions/Future prospects

1. In the context of *B. dorsalis* invasion, harvesting fruits at an early maturity stage ("turning" or very early "yellow-point") is recommended as an environmentally friendly method of FF damage reduction, without fruit quality being adversely affected ([**8**]).
2. As early dropped small fruits may serve as sources of FF outbreaks, woven plastic covers, as a means of mango blossom midge control ([**7**]), may also help reduce FF infestation, making prophylactic removal of fallen fruits useless at this stage. Nut/golf ball collectors (**Fig.14**) could make such removal less tedious on bare soil.
3. More research is required to determine the level of FF regulation by predators under resident vegetation cover. In any case, low level of parasitism by microhymenoptera does not justify recourse to augmentoriums ([**9**]; **Fig.15**) at this stage.

References *(full details upon request)*

[1] Hennessey & Schnell 2001; [2] Peña et al. 2006; [3] Rattanapun et al. 2009; [4] Diatta et al. 2013; [5] Vayssières et al., 2008; [6] Amin 2017; [7] Ratnadass et al. 2019; [8] Vincenot & Normand 2009; [9] Deguine et al. 2011

5-9 October 2020

Acknowledgements. *The authors thank mango producers at Saint-Paul and technical staff at the Bassin-Plat station and the Plant Protection Platform (3P, IBISA), Saint-Pierre*

Funding. This research was conducted as part of the Cirad DPP COSAQ and ECOVERGER project