

Response to the treatment leader of the Draft PT: Irradiation treatment for *Bactrocera tau* (2017-025)

Background: Dr. Peter Leach, the treatment leader of the draft PT: Irradiation treatment for *Bactrocera tau* (2017-025), sent me an email asking three questions related to response to the country comment in first-round consultations.

Q1. Was there an instar sample taken to confirm that your test insects were at the correct life stage? A country comment was that your paper just stated that research by Singh et al 2010 was used to estimate the time period were in each particular life stage.

Submitter response: Singh et al. (2010) reported that the period (longevity) for the development of the egg, 1st, 2nd, and 3rd instar larvae of *Bactrocera* (*Zeugodacus*) *tau* was 1.3±0.39 d, 1.2±0.42 d, 1.7±0.48 d, 4±9.94 d (we think the correct time should be 4±0.94 d), respectively, under laboratory conditions at 25°C and 60–70% RH. During our study, we found that there is no egg hatched within 24 h and the late 3rd instar larvae that developed in pumpkin slices for 7 or 8 days popped out of the diets (refer to Fig. 1 and 2) for pupation. Therefore, the eggs developed for 1, 3, 5, 7, and 8 days, which should be in the stage of egg, 1st, 2nd, 3rd instar larvae and late 3rd instar larvae, respectively, were treated in the dose-response test. Even if the development time for the stages used in the dose-response test have been described in the published paper (Zhan et al. 2015), we explain again and provide some photos taken from the tests, in which the eggs and larvae were irradiated in the primary, dose-response, and confirmatory test, to make clearly understand the radiation process. Unfortunately, the samples of egg and larvae in the test were not collected due to that: 1) the sample is difficult to maintain; 2) there is no requirement for keeping this kind of samples according to ISPM No. 28: phytosanitary treatments for regulated pests.

Singh, S. K., D. Kumar, and V. V. Ramamurthy. 2010. Biology of *Bactrocera* (*Zeugodacus*) *tau* (Walker) (Diptera: Tephritidae). Entomol. Res. 40: 259–263.

Zhan G. P., Ren L. L. Shao Y., Wang Q. L., Yu D. J., Wang Y. J., and Li T. X. 2015. Gamma irradiation as a phytosanitary treatment of *Bactrocera tau* (Diptera: Tephritidae) in pumpkin fruits. J. Econ. Entomol. 108(1):88-94.



Fig 1. Primary test (irradiated at 10 to 70 Gy) on egg, 1st, 2nd, and 3rd instar of *Zeugodacus tau* on 14th, May, 2012.



Fig 2. Primary test (10 Gy) on the third-instar larvae of *Zeugodacus tau* on 14th, May, 2012. 7-d-old larvae (third-instar larvae) popped out of pumpkin diets. After radiation, we collected the popping larvae and then transfer to moist sterilized sand for pupation.



Fig.3 The dose-response test (irradiated at 7 to 63 Gy) on *Bactrocea correcta* and *Zeugodacus tau* at Aug. 2012. Every 3 cups, which was regarded as 3 replicates treated in a radiation dose, were placed in a row and were irradiated in the same time.



Fig. 4. The pumpkins were put into the rearing cage for egg-laying of *Zeugodacus tau* for 2 hours, transferred to plastic cups for their development for 8 days, and then send to the facility for radiation treatment.



Fig.5 Confirmatory test (irradiated at 70 Gy) on pumpkin fruits infested by the late 3rd instar of *Zeugodacus tau* at Sep. 2012.

Q2. Were the three replicates completed at different times? The paper states there were three cups tested for each dose/life stage but no other information was provided.

Submitter response: In order to maintain the same absorbed dose within a treatment that contains 3 replicates (one cup was set as a replicate) during the dose-response test on eggs and larvae, every 3 cups were placed in a row and irradiated at the same time (please refer to Fig. 3).

Q3. Was dose mapping of the treatment chamber undertaken prior to the research being conducted.

Submitter response: Yes, the facility (the National Institute of Metrology Research Irradiator, Beijing, China) conducted dose mapping once half a year. There is one sample of the dose map remained but it is in Chinese (in attachment). The dose rate at 100 cm far away from the radiation source, where we conducted most of the tests, had been measured detailly.

Guoping Zhan (signature)

Guoping Zhan

June 5th, 2020

钴源辐射场剂量分布 \dot{D} (Gy/min)

2012 年 6 月 (3.5 万居里)

(每年衰减 12.6%，每月衰减 1.09%)

距离		吸收剂量率	距离		吸收剂量率
cm		Gy/min	cm		Gy/min
25		76.5 (南)	80		8.3 (南)
30		53.3 (南)	90		6.6 (南)
40	36	28.0 (南)	100	36 H	6.2 (东)
	46	31.0 (南)		36 H	6.0 (东南)
	51	31.5 (南)		36 H	5.5 (南)
	56	32.0 (南)		36 H	6.3 (西南)
	66	30.0 (南)		36 H	6.1 (西)
	76	25.6 (南)		46 H	5.6 (南)
	86	21.0 (南)		56 H	5.6 (南)
50	36	20.0 (南)		66 H	5.5 (南)
	46	21.0 (南)		76 H	5.3 (南)
	56	21.3 (南)		86 H	5.0 (南)
	66	20.3 (南)	120		4.3 (西)
	76	18.0 (南)	140		1.47 (西)
	86	15.2 (南)	150		2.83 (西)
60	36	14.0 (南)	175		2.03 (西)
	46	14.6 (南)	200		1.47 (西)
	56	15.0 (南)	225		1.07 (西)
	66	14.8 (南)	250		0.83 (西)
70	36	11.0 (南)	275		0.67 (西)
	46	11.3 (南)	300		0.56 (西)
	56	11.1 (南)	325		0.47 (西)
	76	10.5 (南)	350		0.41 (西)
	86	9.6 (南)	400		0.31 (西)