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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 9 (1): 93-95, 2006
ISSN 1028-8880

Comparative Studies on the Susceptibility of Various Vegetables to *Bactrocera tau* (Diptera:Tephritidae)

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Abstract: To study on the susceptibility of various vegetables to the females of *B. tau*, six vegetables (sweet gourd, kankrol, cucumber, potol, bottle gourd, snake gourd) were chosen as hosts for comparable studies by using choice and non-choice test. In choice test six species of vegetables were placed in small pieces (300 g) simultaneously for laying eggs by the 50 pairs of flies for the period of 2 h. On the other hand in non-choice test 300 g of either vegetables species were placed as oviposition substrate to 50 pairs of flies. Female flies showed various responses to the vegetables with regards to oviposition and adult emergence. According to the number of eggs laying by the female flies kankrol was found most susceptible and bottle gourd was found less susceptible to *B. tau*.

Key words: *Bactrocera tau*, various vegetables, oviposition responses, adult emergence

INTRODUCTION

Fruit flies are responsible for taking a heavy toll of various types of cucurbit vegetables. In country like Bangladesh where the production of vegetables is already much less then the requirement[1-3]. In Bangladesh pumpkin fly, *Bactrocera tau* (Walker) is a serious pest of cucurbitaceous plants including ash gourd, bitter gourd, kankrol, bottle gourd, cucumber, ribbed gourd, sponge gourd, snake gourd and sweet gourd. Host plants of *B. tau* are Anacardiaceae, Cucurbitaceae, Elaeocarpaceae, Moraceae, Myrtaceae, Oxalidaceae, Rutaceae, Sapotaceae, Solanaceae[4]. How the female insects find and select the proper host to oviposition is a quite complex question. A conjugation of plant physical and chemical factor influences on that choice and the balance between positive and negative stimuli determines the final selection[5-9]. The present studies were conducted to find out the susceptibility of different host vegetables to *Bactrocera tau* and the most suitable host for rearing of this insect.

MATERIALS AND METHODS

Rearing of *B. tau* were maintained at an ambient temperature (28Â±1Â°C) with 80Â±1% relative humidity. The studies were conducted in the fruit fly laboratory of Institute of Food and Radiation Biology, Atomic Energy Research Establishment, Savar, Dhaka in the year of 2004. To study on the susceptibility of various vegetables to the females of *B. tau*, six vegetables were chosen as hosts for comparable studies. These were sweet gourd (*Cucurbita maxima*), kankrol (*Momordica cochinensis*); cucumber (*Cucumis sativus*), potol (*Trichosanthes dioica*), bottle gourd (*Benincasa hispida*), snake gourd *(Trichosanthes anguina*).

Experimental procedure: Choice and non-choice tests[10] were conducted using selected vegetables species. The choice of the vegetables for oviposition, the vegetables had a different acceptability by the females when tested individually. The vegetables were always bought from the same supermarket at Ganakbari, Savar.

Choice test: In the beginning of the experiment 50 recently emerged couples were set in cages (20×20×20 cm) and fed on a adult diet. When the oviposition peak started, in 12 days for the females (once the mating and the egg laying begin earlier in flies raised in laboratory), the six vegetables were offered simultaneously for laying eggs for the period of 2 h. The vegetables were offered in small pieces (300 g) and placed equidistantly from the others. After this egg laying period, egg bearing vegetables were transferred to the culture container for incubation. Oviposition preference was scored as the proportion of eggs laid on each medium. The percentage of adult emergence was recorded.

Non-choice test: Three hundred grams of either vegetables species were placed cages (20×20×20 cm) as oviposition substrate and 50 pairs of flies up to 12 days old were released for 2 h for egg laying. After this egg

laying period, eggs inside the vegetables were transferred for incubation. Total numbers of eggs were recorded. Three replicates were performed.

In both cases, the percentage of the adult emergence was calculated by using the following formula:

$$\text{Percentage of adult emergence} = \frac{\text{Number of adult emerged}}{\text{Number of eggs found}} \times 100$$

RESULTS AND DISCUSSION

The oviposition preference by females for the different tested vegetables at the beginning of the oviposition period showed that kankrol was the preferred by the females. The second vegetables, according to the number of eggs was the cucumber, followed by the snake gourd, sweet gourd, potol and the bottle gourd. Adults emergence was maximum (92.12%) on kankrol and minimum (13.05%) on bottle gourd (Table 1). Flies laid more eggs on cucumber than snake gourd but percentage of adult emergence is higher in snake gourd than cucumber.

The maximum number of eggs (581.33%) was recorded on kankrol and minimum (107.66%) on bottle gourd. highest rate of adult emergence (98.73%) was observed in kankrol. In bottle gourd, the lowest rate of adult emergence (47.98%) was recorded (Table 2).

Many studies have been done to show the importance of different kinds of learning in the choice of host to the feeding of the phytophagous insects[11,12]. Studies with *Rhagoletis pomonella* (Walsh), *C. capitata* and *Dacus tryoni* (Froggatt) have shown that the previous experience of oviposition on a particular host fruit have influences on the extension of the adults accepted or rejected either one or another to oviposition[13,14]. Such data corroborate a model discussed by Courtney *et al.*[15] about the higher acceptance of hosts with lower hierarchic positions after the females had been exposed to them.

In both choice and non choice tests, the present results indicated that kankrol were found most susceptible and bottle gourd were found less susceptible to *B. tau*. Influence of six vegetables traits on oviposition preference was observed in both tests of the present study. The influence of three tomato cultivars on ovipositon preferences to *B. tryoni* was reported[16]. The authors showed correlation between oviposition preference and offspring performance of *B. tryoni* among the three tomato cultivars. Six natural hosts were tested to compare their suitability for oviposition preferences to *Bactrocera dorsalis* in controlled laboratory condition[17]. Iara *et al.*[18] reported the oviposition preference hierarchy in *Ceratitis capitata* by influence of female age and experience.

Table 1: Reproductive potential of *Bactrocera tau* in different vegetables using choice test

Vegetables species	No. of eggs laid by females Mean±SE	Adults emerged Mean±SE	Adults emerged (%)
Kankrol	144±4.58	132.66±5.6	92.12
Snake gourd	43±3.22	38.66±2.96	89.90
Cucumber	59.33±2.96	46.66±4.26	78.64
Sweet gourd	26.66±2.03	20.33±1.45	76.26
Potol	13±1.73	4.33±1.45	33.30
Bottle gourd	7.66±1.45	1±0.57	13.05

SE = Standard error, Three replicates were used

Table 2: Reproductive potential of *Bactrocera tau* in different vegetables using Non-choice test

Vegetables species	No. of eggs laid by females Mean±SE	Adults emerged Mean±SE	Adults emerged (%)
Kankrol	581.33±3.53	574±3.05	98.73
Snake gourd	362.66±7.83	352.33±5.62	97.15
Cucumber	192.33±3.92	169.66±4.90	88.21
Sweet gourd	192.33±3.92	156.33±2.72	81.28
Potol	135±3.21	89.66±1.20	66.41
Bottle gourd	107.66±3.38	51.66±2.90	47.98

SE = Standard error, Three replicates were used

REFERENCES

1. Anonymous, 1993. Research and development of vegetables crops. Paper presented in the workshop on March 9-10 at BSMRAU (former IPSA), Gazipur., pp: 1-7
2. Hossain, A.K.M.A., M.A. Haque and M.S.U Chowdhury., 1990. Vegetables research in Bangladesh. In: Vegetables Research and Development in South Asia. S. Shanmugasundram (Ed.) Proceeding of Workshop held at Islamabad, Pakistan on 24-29 September, 1990. AVRDC Publication. No. 90-331. AVRDC, Taiwan., pp: 29-133.
3. Ramphall and H.S. Gill, 1990. Demand and supply of vegetables and pulses in South Asia. In: Vegetables Research and Development in South Asia. S. Shanmugasundram (Ed.) Proceeding of Workshop held at Islamabad, Pakistan on 24-29 September.1990. AVRDC publication. No. 90-331. AVRDC, Taiwan., pp: 59-165.
4. Carroll, L.E., A.L. Norrbom, M.J. Dallwitz and F.C. Thompson., 2004. Pest fruit flies of the world- larvae. Version: 13th April 2005. http://delta-intkey.com'.
5. Eismann, C.H. and M.J. Rice., 1985. Oviposition behaviour of *Dacus tryoni*: The effects of some sugars and salts. Entomologia Exp. Appl., Dordrecht, 39: 61-71.

6. Kostal, V., 1993. Physical and chemical factors influencing landing and oviposition by the cabbage root fly on host-plant models. Entomologia Exp. Appl., Dordrecht, 66:109-118.
7. Mcinnis, D.O., 1989. Artificial oviposition sphere for Mediterranean fruit flies (Diptera: Teprhitidae) in field cages. J. Econ. Ent., 82: 1382-1385.
8. Messinna, F.J., 1990. Components of host choice by two *Rhagoletis* species (Diptera: Tephritidae) in Utah. J. Kans. Ent. Soc., 63: 80-87.
9. Oi, D.H. and R.F.L. Mau, 1989. Relationship of fruit ripeness to infestation in "Sharwil" avocados by the mediterranean fruit fly and oriental fruit fly (Diptera: Tephritidae). J. Econ. Entomol, Lanham, 82: 556-560.
10. Rahman, M.M. and G.H. Schmidt, 1997. Comparative studies on the susceptibility of various pulses to *Callosobruchus phaseoli* (Gyllenhal) (Insecta Coleoptera Bruchidae). Boll. Zool. Agrico. Bachic. 29: 183-187.
11. Papaj, D.R. and M.D. Rausher, 1987. Components of consespecific host plant discrimination by *Battus philenor* (Papilionidae). Ecology, 68: 245-253.
12. Traynier, R.M.M., 1979. Associative learning in the oviposition behavior of the cabbage butterfly, *Pieris rapae*. Entomologia Exp. Appl., 9: 465-472.
13. Papaj, D.R. and R.J. Prokopy, 1986. Phytochemical basis of learning in *Rhagoletis pomonella* and other herbivorous insects. J. Chem. Ecol., 12: 1125-1143.
14. Prokopy, R.J. and B.S. Fletcher, 1987. The role of adult learning in the acceptance of host fruit for egglaying by the Queensland fruit fly, *Dacus tryoni*. Entomologia Exp. Appl., 45: 259-263.
15. Courtney, S.P., G.K. Chen and A. Gardner, 1989. A general model for individual host selection. Oikos, 55: 55-65.
16. Vijaysegaran, B.S., S. Drew, A.I. Richard and S. Raghu, 2005. Influence of fruit traits on oviposition preference and offspring performance of *Bactrocera tryoni* (Froggatt) (Diptera: Tephritidae) on three tomato (Lycopersicon lycopersicum) cultivars. Aus. J. Entomol., 44: 97-103.
17. Khan, M., R.M. Shahjahan and M.A. Wadud, 2000. Evaluation of different hosts for laboratory rearing of oriental fruit fly, *Bactrocera dorsalis* (Hendel) (Diptera:Tephritidae). Bangladesh J. Zool., 28: 41-47.
18. Joachim-Bravo, I.S., O.A. Fernandes, S.A. Bortoli and F.S. Zucoloto, 2001. Oviposition preference hierarchy in *Ceratitis capitata* (Diptera: Tephritidae): Influence of female age and experience. Iheringia, Sér. Zool., 91: 93-100.