

Ministry of Agriculture, Livestock and Irrigation

Department of Agriculture

Plant Protection Division



**Occurrence of Fruit Flies (Diptera: Tephritidae) in Mango Orchards in
Mandalay Region and Southern Shan State**

(ရှမ်းပြည်နယ်တောင်ပိုင်း နှင့် မန္တလေးတိုင်းဒေသကြီးရှိ သရက်ခြံများတွင်
သီးထိုးယင်ကျရောက်မှု အခြေအနေလေ့လာခြင်း)



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Introduction

- Mango is important fruit in Myanmar and it is mainly grown in Mandalay, Yangon, Bago, Sagaing, Ayeyarwaddy Regions and Southern Shan State.
- The export quality mango cultivars are mainly produced from Mandalay, Sagaing Regions and Southern Shan State (Win, 2008).
- Mango is not only consumed in the country but also important for export.
- About 46 species of insect pests recorded in mango orchards in Myanmar and fruit fly is one of the economically important insect pests on mango fruits (PPD,2009).
- The extent of losses to fruits varies according to fruit fly species and the host plant species (Noman *et al.*, 2022).



Problem Statement

- Fruit flies (Diptera: Tephritidae) attack a wide range of fruits and vegetables.
- It pose a significant threat to mango production worldwide including in Myanmar.
- The fruit fly affects both direct losses of yield and quality of mango fruits, and it can be considered as a major constraint to mango export (Nakahara *et al.*, 2018).
- The genus *Bactrocera* comprises 651 described species in tropical Asia, the south Pacific and Australia, at least 50 species considered to be important (Vargas *et al.*, 2015)
- In this regard, fruit fly species diversity in mango production areas, major fruit fly species on mango and its population abundance are necessary for the market access information and risk management program.
- Therefore, this study was focus on above areas to promote of mango exports.



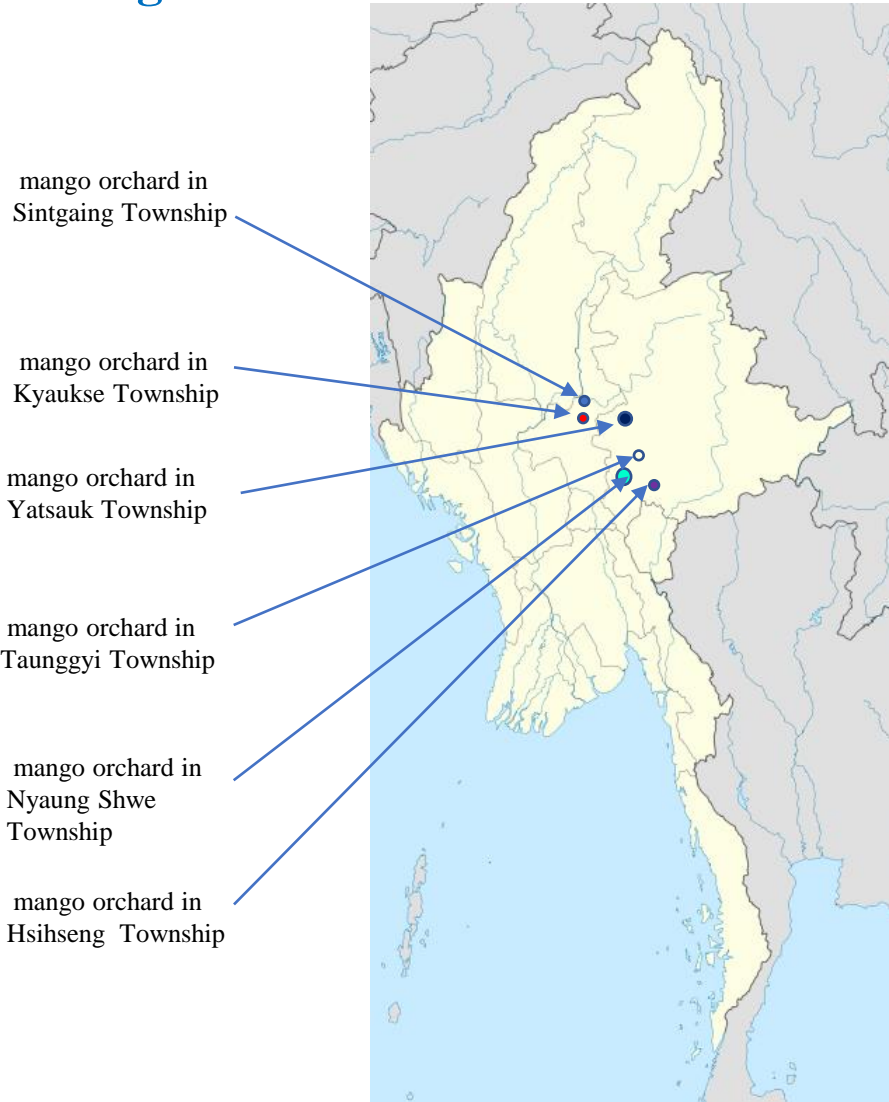
Objectives

- To explore the diversity of fruit flies in mango orchards
- To determine the population abundance of major fruit fly species at mango orchards in different locations

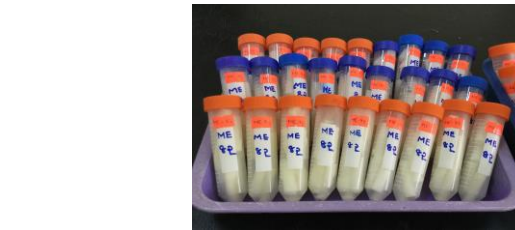


Materials and Methods

Fig 1. Survey locations in Mandalay Region and Southern Shan State



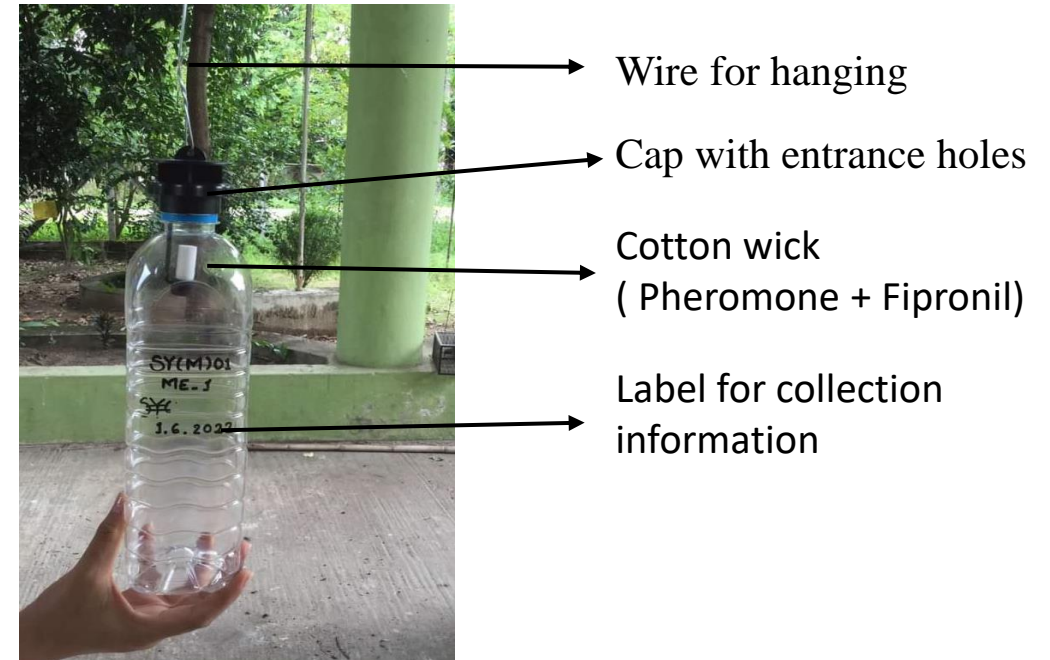
- Survey Site: 6 mango orchards in 6 locations
- Survey Area: 4 – 6 Acre
- Monitoring Survey Period: Jan – Dec, 2022
- Type of monitoring: Trapping
- Trapping Pheromone: Cylindrical plastic trap (modified Lynfield type) with Methyl Eugenol, Cue-Lure, Capi-Lure) + Fipronil (3:1)



Materials and Methods

- No. of Trap/orchard: 10 trap
(ME - 8, Cue -1, Capi- 1)
- Trap distance: 50 meter
- Trap height: 2.0-3.0 m above the ground level
(according to plant canopy)
- Collection interval: 2 week
- Collection method: trap catches flies were kept in paper bag, sent to PPD, Yangon
- Refreshment of Pheromone: 1 month interval

Fig 2. Plastic trap (modified Lynfield type) used in this survey



Materials and Methods

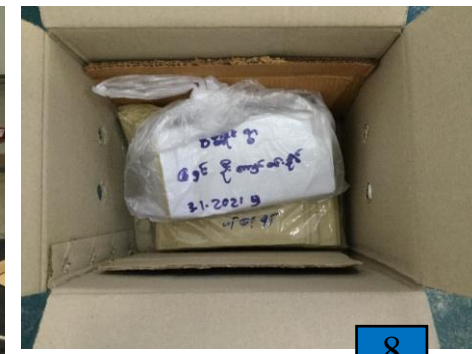
- Infested fruits collection :Collected fruit fly infested mango fruits at harvesting stage
- Counting number & ident. of fruit fly specimen :Fruit Fly Lab, PPD, Yangon
- Identification method :External morphology character using Stereo microscope
- Data analysis -All Graphs prepared in the Microsoft excel version 2016
-FTD (flies catches/trap/day)population index calculated by;

$$FTD = \frac{F}{T \times D} \quad (\text{IAEA, 2003})$$

F = total number of fruit flies

T = number of inspected traps

D = average number of days traps were exposed.



Materials and Methods

Table 1. Phenology stages of mango

Phenology Stages	Mandalay Region	Southern Shan State
Vegetative growth	Sept - Nov	Oct - Dec
Flowering	Dec - Jan	Jan -Feb
Fruit formation and development	Feb - Mar	Mar - Apr
Fruit maturity and harvesting	Apr - Jun	May - July

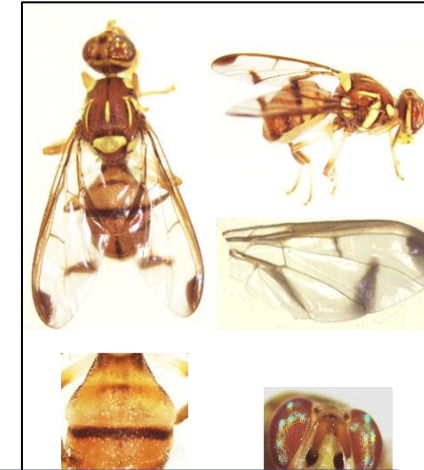
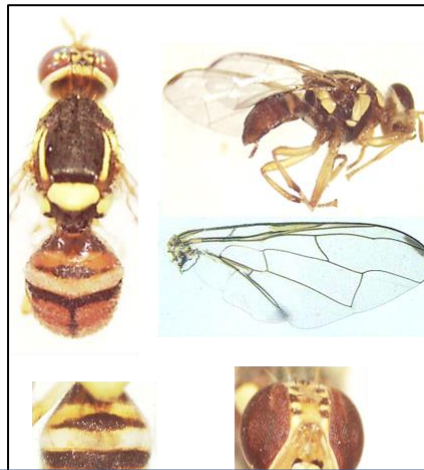
Table 2. Vegetation Types at each orchard

Survey location	GPS position of survey orchard	Elevation (Meter)	Vegetation
Sintgaing	21° 47' 09" N 96° 03' 55" E	82.29	<i>Mangifera indica</i> L cv. Sein Ta Lone, Yinkwe, U Mayri Ya(20-50 yrs)
Kyaukse	21° 36' 36.81" N 96° 08' 03.24" E	89.91	<i>Mangifera indica</i> L cv. Sein Ta Lone, Yinkwe , Hinthar, Local CV (25-30 yrs)
Yatsauk	21° 14' 43.80" N 96° 53' 00.08" E	917.44	<i>Mangifera indica</i> L cv. Sein Ta Lone, Yinkwe(15-20 yrs)
Taunggyi	20° 50' 47" N 97° 00' 28" E	1392.63	<i>Mangifera indica</i> L cv. Sein Ta Lone (15-18 yrs)
Hsihseng	20° 24' 23" N 97° 14' 01" E	938.47	<i>Mangifera indica</i> L cv. Sein Ta Lone (15-18 yrs)
Nyaung Shwe	20° 44' 44" N 96° 59' 53" E	893.06	<i>Mangifera indica</i> L cv. Sein Ta Lone (20 yrs)

Results and Discussion

Table 3. Fruit fly species trapped in mango orchards in Mandalay Region and Southern Shan State

No.	Fruit fly species	Pheromone Attractant
1	<i>Bactrocera correcta</i>	Methyl eugenol
2	<i>Bactrocera dorsalis</i>	Methyl eugenol
3	<i>Bactrocera (Zeugodacus) cucurbitae</i>	Cue lure
4	<i>Bactrocera cilifera</i>	Cue lure
5	<i>Bactrocera (Zeugodacus) tau</i>	Cue lure



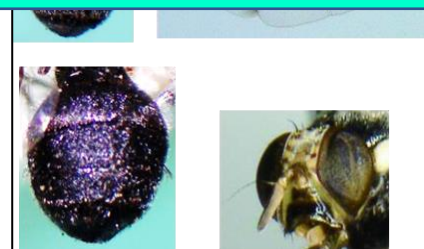
Identification was done by Scutum color, vittae on scutum, shape of vittae, wing pattern (costal band, cross band, anal streak), scutellum color, shape and setae, abdomen color and marking, face and leg color etc..

Reference:1. The Australian Handbook for the identification of fruit flies (Version 3.1)

2. Fruit Fly ID Australia <<https://www.fruitflyidentification.org.au/>> (online)

3. Key to the Tropical Fruit Flies of South East Asia (Drew & Romig, 2013)

12	<i>Bactrocera nigrifacia</i>	Cue lure
13	<i>Bactrocera rubigina</i>	Cue lure
14	<i>Bactrocera diversa</i>	Methyl eugenol
15	<i>Bactrocera bhutaniae</i>	Cue lure



4. *Bactrocera cilifera*

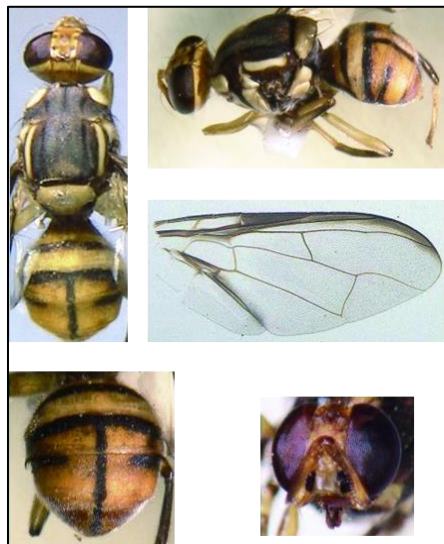
5. *Zeugodacus tau*

6. *Bactrocera tuberculata*

Results and Discussion



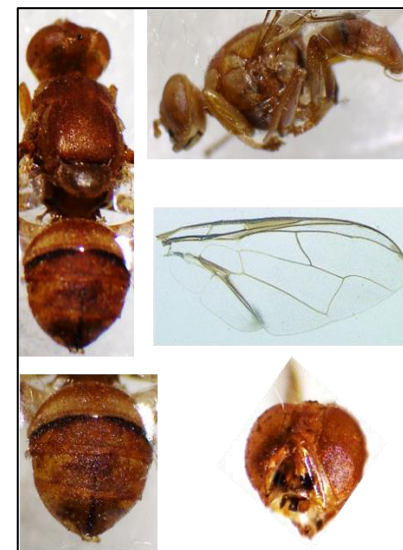
7. *Zeugodacus caudata*



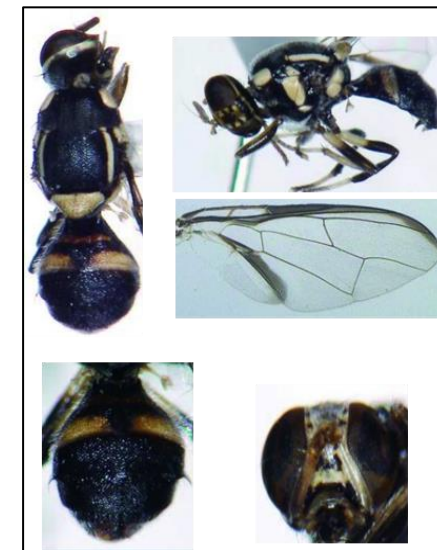
8. *Bactrocera carambolae*



9. *Bactrocera scutellaris*



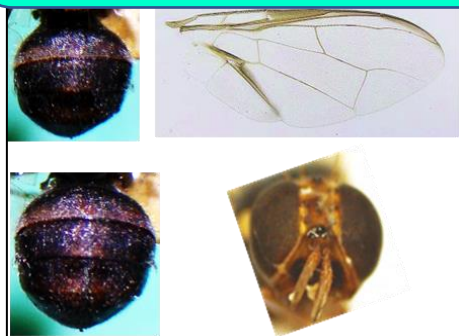
10. *Bactrocera zonata*



11. *Bactrocera incisa*

Among them, 14 species have been already recorded by Nakahara *et al.*, 2019.

The species of *B. scutellaris* was new record in mango orchards in Myanmar.



12. *Bactrocera nigrifacia*



13. *Bactrocera rubigina*



14. *Bactrocera diversa*



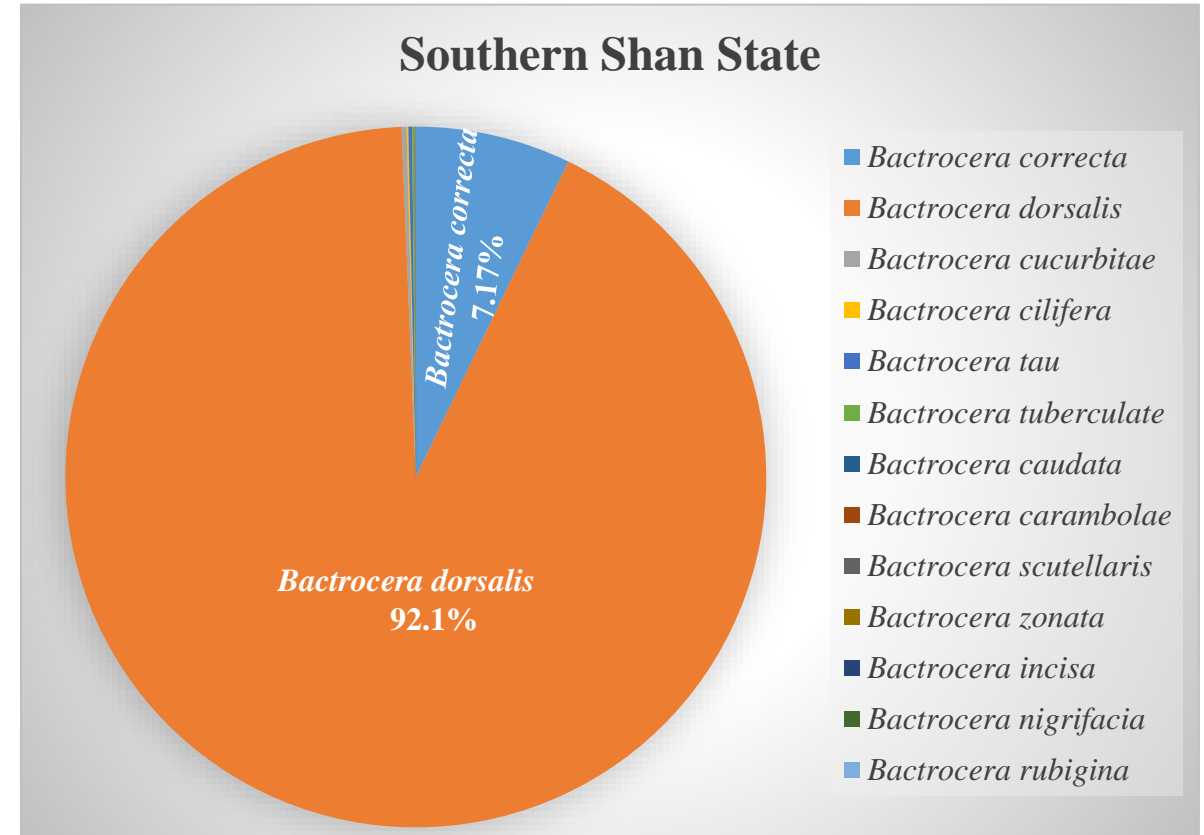
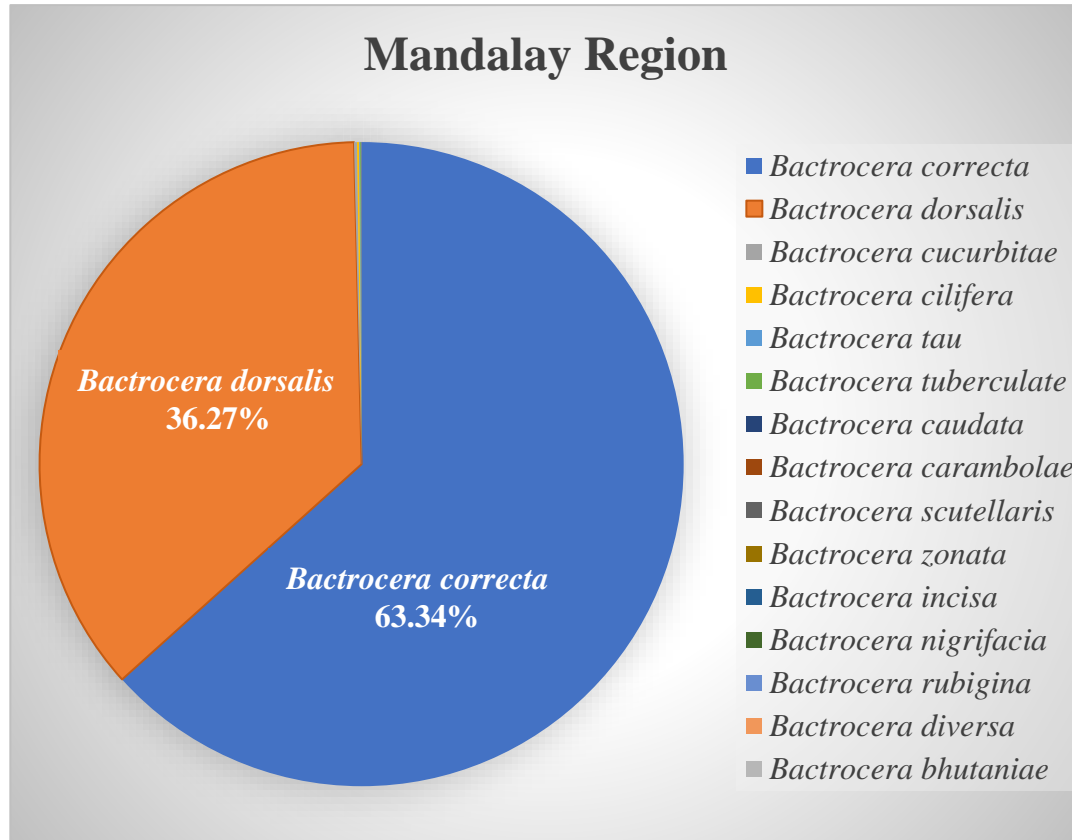
15. *Bactrocera bhutaniae*

Results and Discussion

Table 4. Population of fruit fly species catches from mango orchards in Mandalay Region and Shan State from Jan – Dec 2022

No.	Fruit fly species	Total number of sample catches in Mandalay Region		Total number of sample catches in Shan State			
		Sintgaing	Kyaukse	Yatsauk	Taunggyi	Hsihseng	Nyaung Shwe
1	<i>Bactrocera correcta</i>	196,809	54,419	7,549	564	671	1,343
2	<i>Bactrocera dorsalis</i>	103,700	40,153	56,649	20,487.	23,844	29,107
3	<i>Bactrocera cucurbitae</i>	373	221	46	89	76	115
4	<i>Bactrocera cilifera</i>	112	308	34	24	31	26
5	<i>Bactrocera tau</i>	134	41	50	70	69	53
6	<i>Bactrocera tuberculata</i>	17	4	19	36	40	59
7	<i>Bactrocera caudata</i>	60	7	0	3	2	5
8	<i>Bactrocera carambolae</i>	0	2	4	0	0	0
9	<i>Bactrocera scutellaris</i>	13	0	3	0	3	6
10	<i>Bactrocera zonata</i>	0	2	2	12	16	14
11	<i>Bactrocera incisa</i>	8	2	1	0	2	4
12	<i>Bactrocera nigrifacia</i>	0	1	0	3	5	6
13	<i>Bactrocera rubigina</i>	2	0	0	0	0	0
14	<i>Bactrocera diversa</i>	5	2	1	4	2	0
15	<i>Bactrocera bhutaniae</i>	4	1	0	2	0	0
	Total	301,237	95,163	64,358	21,294	24,761	30,738

Results and Discussion



Total population of *B. correcta* (63.34%) was found to be 1.7 times higher than *B. dorsalis* (36.27%) in Mandalay Region while *B. dorsalis* (92.1%) was 12.8 times higher than *B. correcta* (7.17%) in Southern Shan State.

Results and Discussion

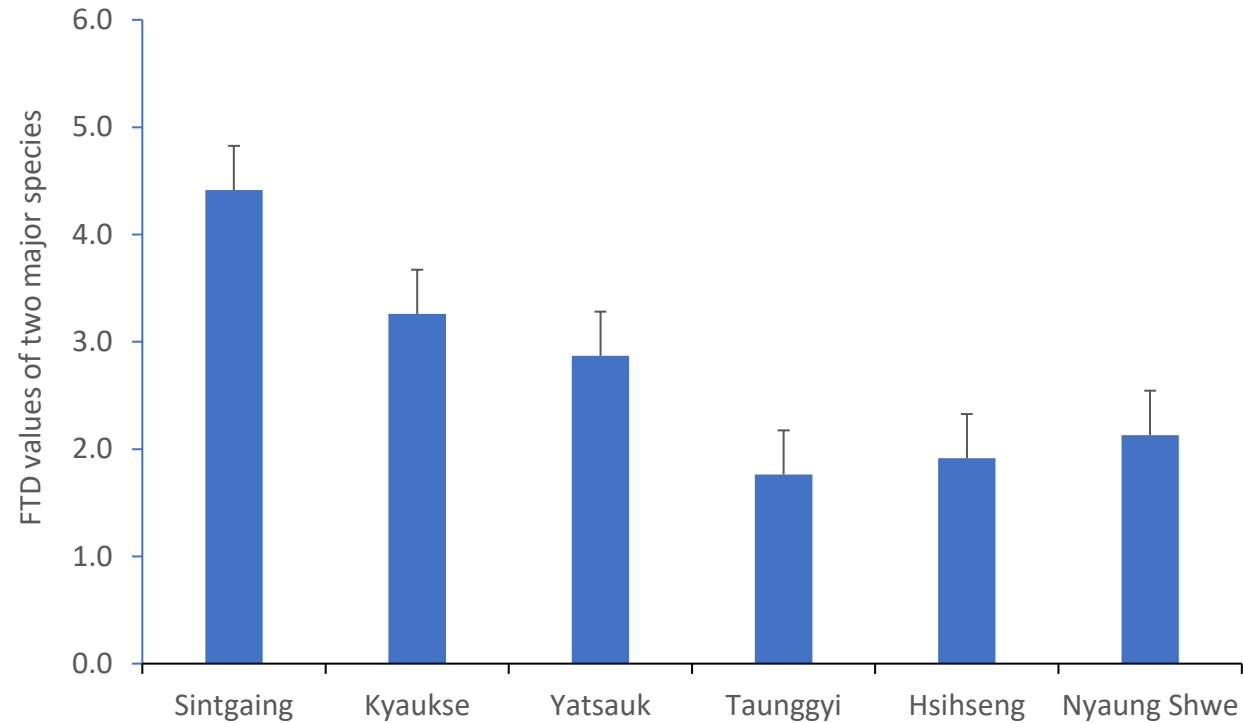
Table 5. Number of fruit flies reared out from the infested mango fruits

No.	Species	No. of flies
1	<i>Bactrocera correcta</i>	1,027
2	<i>Bactrocera dorsalis</i>	1,245
3	<i>Bactrocera carambolae</i>	4

Therefore, *B. dorsalis* and *B. correcta* were the major fruit flies species in the mango orchards.

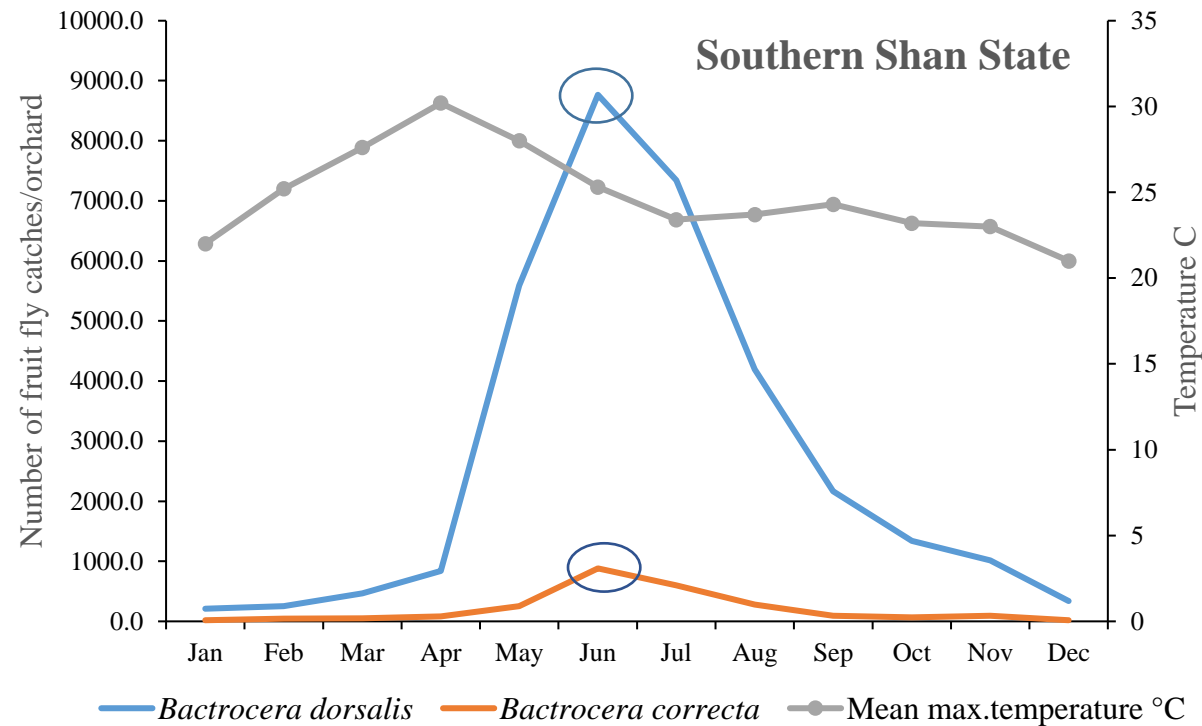
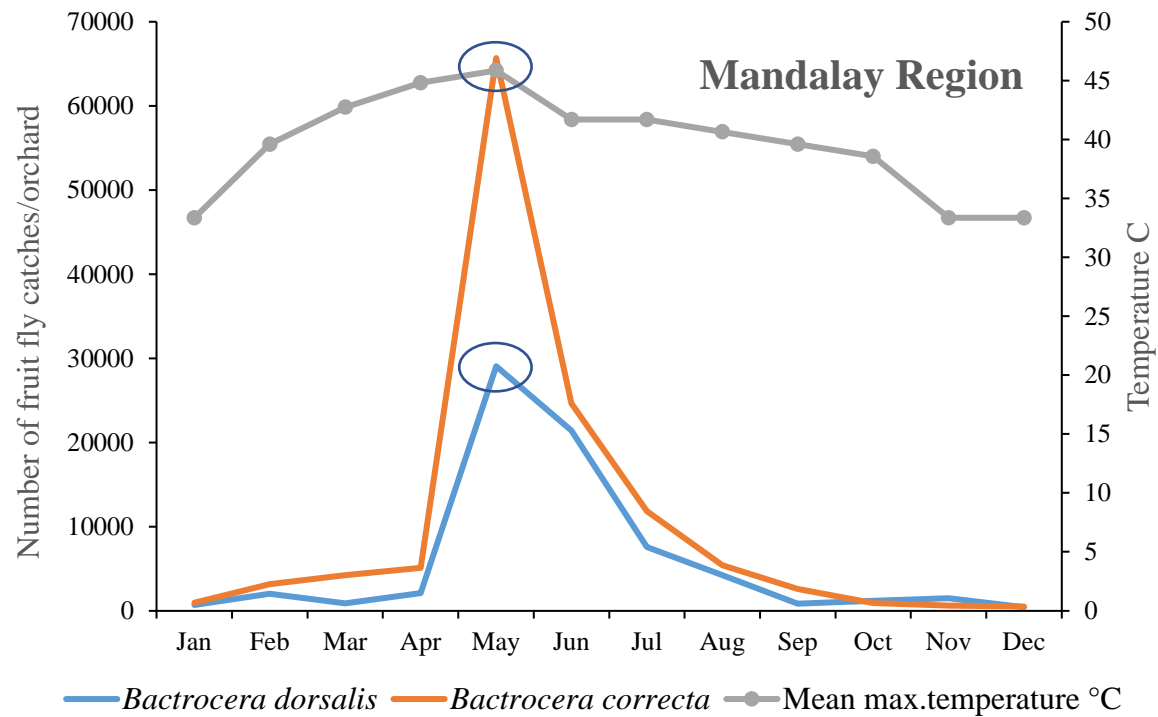
Results and Discussion

FTD values of two *major fruit flies species of mango* showed 4.4 (S) > 3.3 (K) > 2.9(Y) > 2.1(NS) > 1.9(S) > 1.8 (T)



It could be affected on host plant age, mixed cultivar of mango in the orchards, the management practices, availability of host plants surrounding areas, weather factors.

Results and Discussion



These findings could be coincided with the mango fruits maturity and harvesting stages, and high mean temperature.

population (Felicia *et al.*, 2013; Danjuma *et al.*, 2014; Bota *et al.*, 2018).

Conclusion and Recommendation

- Fruit flies species *Bactrocera correcta* and *B. dorsalis* are two major species present in the mango orchards.
- This can be the phytosanitary concern for the trading partners in the mango exports.
- The population fluctuation results can assist the growers in predicting population growth and taking precautionary measures.
- The results from this study will be of a great importance for the market access information for new markets and implementation of risk management program such as integrated pest management program in the field and phytosanitary treatment program.
- Further study will be necessary to conduct phytosanitary treatment on mango using two major fruit flies species.



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Acknowledgement



Mango orchards owners in Shan State & Mandalay Region

DG, Dy DG
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PPD, Directors
of Shan State
and Mandalay
Region

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Protection
Staff from
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and Mandalay
Region

Staff from
Fruit Fly lab.
PPD

Fruit Fly
Taxonomist
from DoA,
Thailand

Thank you