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Farmer perception about the damage caused by fruit borer on mango. A case study of District Multan, Punjab, Pakistan

Hasnain Abbas[1], Qaisar Abbas*[2], Shafqat Saeed[1], Muhammad Iqbal[3], Mussurrat Hussain[2], Muhammad Hasnain[2], Muhammad Shahid[3], Ali Raza[3], Hammad Husnain[3]

[1]Department of Entomology, Muhammad Nawaz Sharif University of Agriculture, Multan, Pakistan

[2]Entomological Research Sub Station, Multan, Pakistan

[3]Cotton Research Institute, Multan, Pakistan

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Abstract

Mango is one of the major sources of foreign exchange earnings of Pakistan. It is produced at a large scale in Punjab and Sindh provinces of Pakistan. But Punjab has major share in production, the district Multan is famous for mango cultivation. The production of mango in Pakistan is low as compared to other mango growing countries of world. There are many yield limiting factors of mango crop but the insect pests are considered as key factors as a yield limiting factors. Among the insect pest, fruit borer is known as a major pest. This study was conducted to determine, perceptions and practices of mango growers regarding fruit borer pests and their management practices in Multan. For this purpose, 30 growers of mango district were selected randomly.

* **Corresponding Author:** Qaisar Abbas ✉ abbas603@gmail.com

Introduction

Fruits plays very important role as a export product in the economy of Pakistan. The soil and environment of Pakistan are most suitable for the production of fruits. . Due to suitable conditions of environment almost 30 types of fruits are frequently produced in Pakistan. The common fruits grown in Pakistan are citrus, mango, apple, dates, grapes, banana, melons and guava (Khan & Shaukat, 2006; Government of Pakistan, 2008-2009). Mango is national fruit of Pakistan and it also called "King of the Fruits". It is second major fruit of Pakistan after citrus. Mango consists of essential component which prove benefit for health. Mango size, color is different according to location and climatic condition. Mango is an outstanding origin of vitamin A and C, as well as a great source of potassium, beta-carotene and fiber. Normally, it is produced for human needs as raw or ripe mango products (Sruamsiri and Silman, 2009). It is grown on an area of 93.42 thousand hectares with production 915.7 thousand tones. The largest production districts of Mango are Multan, Bahawalpur, Muzzaffar garh and Rahim yar Khan. The taste of Mango varieties of Multan is famous among all Worlds. There are lot of varieties which are found in Pakistan, but some varieties are very common, such as Sindhri, Langra, Chaunsa, Fajri, Samar Bahist, Anwar Ratool, Dusehri, Saroli, Tuta Pari, Neelam, Maldah, Collector, Began Phali, etc but the Sindhari is considered as the king of mango varities. There are many reasons for low production of mango in Punjab Pakistan but the insect pests are one of major cause. Among the insect pests the fruit borer is one of key pest of mango crop. Mango Fruit Borer (Citripestis eutraphera) is one of the major pest of Mango. Now days it has becomes the most destructive pest of Mango after Fruit flies. Female fruit borer preferred mostly smaller size of fruit for egg laying (Krull 2004). Mango Fruit Borer eggs are less than 1mm in size, egg laying mostly found on fruit or stalk. Eggs of borer white in colour at the time of egg laying but change into red. Eggs hatch in just 2-3 days. Early instars of borer feed on skin surface but when it reached to 3rd instar it start tunneling towards seeds. Next instars also feed inside fruit and damage the fruit. Mostly fruit fall on the ground after the attack of Borer (Water House, 1998). and borer larvae complete there cycle in 12-15 days. More than one larvae may be present in single fruit (Anderson and Tran-Nguyen, 2012). After completing their cycle in Fruit larvae pupate either in soil or fruits which falls on ground. And it complete pupal stage in 2 weeks. Adult forewings are ground color yellowish grey, veins black scaled, antimedian band does not exist. Hind wings are ground color with dirty white with black scales along veins. Antennae are pectinate, thorax is light brown and legs are fuscous with interserpersed cream white. (Anderson and Tran-Nguyen, 2012) The larvae feed on immature mango fruits causing large fruit damage. The damaged fruits have bored holes with frass and the fruit mostly look black around the bored area. The young larvae were found drag the fruit skin causing nearest characteristic scab like patch and the later stage larvae found boring into the fruit. This damage is easily seen in the field and infested fruits are unlikely to be harvested causing big loss to farmers. In case of young fruits, premature fruit drop was also seen in the orchards. This survey study was sought to determine the key features associated with the knowledge, perceptions and practices of fruit producers regarding fruit Borer pests and their management practices in Multan. The aim of study was to describe the demographic profile of fruit growers, determine the knowledge and perceptions of fruit growers regarding fruit borer and assess their fruit borer control efforts and the way forward to addressing the fruit borer menace. This study could be helpful in making policies for betterment of mango growers.

Material methods

Study Area

The study was conducted in the district Multan, one of the famous city of Pakistan regarding mango cultivation. Multan is located at the Altitude of 122m, Latitude: 30°11′44″N, Longitude: 71°28′31″ E. Multan is located in the southern part of Punjab, province in Pakistan. Multan features an arid climate with very hot summers and cold winters. The city witnesses some of the most extreme temperatures in the country. Dust storms are a common occurrence within the city. The closest major city is Bahawalpur.

The area around the city is a flat plain and is ideal for agriculture, with many citrus and mango farms. There are many canals that cut across the Multan District, providing water from nearby farms. This makes the land very fertile. However usually land close to the Chenab River are flooded in the monsoon.

Climate of Multan

Multan has four seasons: Winter, summer, autumn and Spring. The monsoon season also occurs in summer.

Winter

Winter season start from the month of December and remain till February. During the winter season lowest temperature recorded during January and highest temperature recorded during the month of December. The Average temperature of January is 4.5°C while Average temperature of December is 22.7°C .Mostly rains occur when temperature further decreased. Maximum rainfall recorded during the month of February that is 9.2 milimeter.

Spring

Spring season fall between start of March and last till April. Highest average temperature is 35°C. And lowest average temperature recorded during March which is 13.5°C .The spring season begins from March and last till April. Highest rainfall monthly recorded during the month of March which is 19.5 milimeters.

Summer

The summer season start from May and remain till September. Summer is the longest season of Multan. Monsoon rains also occur in this season, these rains start from June till September. Temperature are maximum found in Multan during summer. Maximum rains also occur during monsoon season. Heavy rains also occur during monsoon season. The highest average temperature recorded in summer is recorded in June that is 42.3°C while the lowest was recorded in September that is 24.9°C.

Autumn

This season start from October and ends in November. Mostly this season is also called dry season. The maximum average temperature was record in the month of October that is 34°C and the lowest average temperature is 10.9°C recorded in November The highest monthly average rainfall of Autumn is 2.1 millimeters recorded in the month of October.

Survey Method

The descriptive method of research was used for this study. This data was taken from whole Multan districts but farmers and orchards selection mostly at random. We select at least 2 orchards from each union council which have orchards. Mostly visit time is early in morning or after 04 PM. Busy hours of the farmers were respected, and interviews were conducted at their free time. The data was collected from 32 orchards from selected area. The main focus is to represent the whole district. The farmers were interviewed by at their homes and farms. The objective of the research study was explained to the farmers before starting the actual interview. The data collected was tabulated systematically and analyzed statistically. Statistical Package for Social Sciences (SPSS) was used for data analysis. All the results were presented in counts and percentages in different tabular form.

Results

Main objective of study was to determine the perceptions and practices adopted by the mango growers regarding fruit Borer management in Multan.

Age

The results are presented in table no.1

Majority of farmers (66.7%) participated in this survey were at the age of 41-61 years old, while 26.7% farmers were at the age of more than 60 year and rest of 6.7% farmers were more than 60 years old.

Gender

The results are presented in table no.2

All the farmers who participated in this survey were male (100%).. There is no female or She male is the owner of any orchard in Multan.

Qualification

The results are presented in table no.3

During this survey it was noted that 40% mango growers are illiterate, while 23% have education level of middle school. Only 13.3% farmers are metric pass

and 23.3% mango growers have education up to graduation. This indicate that major portion of farmers which grow mango are illiterate, they need formal education to improve their farming practices.

Income/Acre

The results are presented in table no.4

Nine catagories of the income of mango growers were observed. The survey indicate that 33.3% farmers earn minimum level of income i.e. 10,000-20,000 per anum. While 10% famers earn 20,000-40,000 per anum and 20% growers earn 40,001-60,000 per anum and 3.3% farmers gets 60,000 to 80,000. It was noted that 6.6% farmers earn income 160,000-200,000 per anum. It has been asumed that 40% growers included in survey were illitrate and 33.3% of these farmers are earning minimum income per anum and 7% have graduate level of education and 6% of them are getting maximum earning. So eduation is prime factor which play key role in increasing the income of growers.

Ownership

The results are presented in table no.5

In this study of farmers visit it is noted that mostly farmers are owner of orchard i.e. 66.7%. Followed by 26.7% people are tenant and 6.7% people on sharing.

Total Land Area

The results are presented in table no.6

In this study it was noted that mostly farmers have total land between the range of 13-25 acres which is 43.3% and only 3% farmers have land more than 100 Acres were visited.

Area under Mangoes

The results are presented in table no.7

Farmers participated in this survey, 33% have less than 5 acres land and 43.3% have 5-12.5 acres and 26.7% have 13-25 acres while 10% have 25-100acres and 6.7% have more than 100 acres.

Sampling Stage

The results are presented in table no.8

During this survey mostly orchards are on Fruiting stage 66.7% (20) while non Fruiting stage orchards are represent 33.3% (10).

Age of Orchard

The results are presented in table no.9

During this survey mostly visited mango orchard falls in the range of 21-25 years old are i.e. 26.7%, while 16.7% are at the age of 5-10 years, 13.3% are at the age of 11-15 years, and 20% orchard were at the age of 16-20 years old.

Table 1. Distribution of Mango farmers regarding their age.

Year	Frequency	Percent	Valid Percent	Cumulative Percent
20-40	8	26.7	26.7	26.7
41-60	20	66.7	66.7	93.3
>60	2	6.7	6.7	100.0
Total	30	100.0	100.0	

Table 2. Distribution of Mango farmers regarding their gender.

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	30	100.0	100.0	100.0

Table 3. Distribution of Mango farmers regarding their qualification.

	Frequency	Percent	Valid Percent	Cumulative Percent
Illetrate	I	40.0	40.0	40.0
Middle	7	23.3	23.3	63.3
Matric	4	13.3	13.3	76.7
Graduate	7	23.3	23.3	100.0
Total	30	100.0	100.0	

Table 4. Distribution of Mango farmers regarding their Income/acre.

Rupees (RS)	Frequency	Percent	Valid Percent	Cumulative Percent
10,000-20,000	10	33.3	33.3	33.3
20,001-40,000	3	10.0	10.0	43.3
40,001-60,000	6	20.0	20.0	63.3
60,001-80,000	1	3.3	3.3	66.7
1,00,001-1,20,000	3	10.0	10.0	76.7
1,20,001-1,40,000	2	6.7	6.7	83.3
1,40,001-1,60,000	3	10.0	10.0	93.3

Rupees (RS)		Frequency	Percent	Valid Percent	Cumulative Percent
1,60,001-1,80,000		1	3.3	3.3	96.7
180,001-200,000		1	3.3	3.3	100.0
	Total	30	100.0	100.0	

Table 5 Distribution of Mango farmers regarding their owner ship.

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Owner	20	66.7	66.7	66.7
Tenant	8	26.7	26.7	93.3
Sharing	2	6.7	6.7	100.0
Total	30	100.0	100.0	

Table 6. Distribution of Mango farmers regarding their land area.

Acre	Frequency	Percent	Valid Percent	Cumulative Percent
<5	2	6.7	6.7	6.7
5-12.5	10	33.3	33.3	40.0
13-25	13	43.3	43.3	83.3
25-100	2	6.7	6.7	90.0
>100	3	10.0	10.0	100.0
Total	30	100.0	100.0	

Table 7. Distribution of Mango farmers regarding their mango cultivated area.

Acres	Frequency	Percent	Valid Percent	Cumulative Percent
<5	4	13.3	13.3	13.3
5-12.5	13	43.3	43.3	56.7
13-25	8	26.7	26.7	83.3
25-100	3	10.0	10.0	93.3
>100	2	6.7	6.7	100.0
Total	30	100.0	100.0	

Table 8. Distribution of Mango farmers regarding their sampling stage.

Fruiting	Frequency	Percent	Valid Percent	Cumulative Percent
	20	66.7	66.7	66.7
Non-Fruiting	10	33.3	33.3	100.0
Total	30	100.0	100.0	

Table 9. Distribution of Mango farmers regarding their Orchard Age.

Year	Frequency	Percent	Valid Percent	Cumulative Percent
5-10	5	16.7	16.7	16.7
11-15	4	13.3	13.3	30.0
16-20	6	20.0	20.0	50.0
21-25	8	26.7	26.7	76.7
26-30	2	6.7	6.7	83.3
>30	5	16.7	16.7	100.0
Total	30	100.0	100.0	

Mango orchard sale

The results are presented in table no.10

During this conducted survey it is observed that mostly mango growers i.e. 70% sale their mangoes in local markeet. While 30% growers export their produce to various countries of world.

Fertilizer

The results are presented in table no.11

During this survey it is observed that 63.3% mango grower used Urea as a fertilizer in Mango orchard. While 36.7% grower used different fertilizer combination like FYM, Potash etc for the better growth of Mango plants.

Irrigation

The results are presented in table no.12

During this survey it is observed that 3.3% farmers irrigate the field after every 4 days interval 66.7% people irrigate the orchard after every 7 day interval. 10% irrigate the field after every 8 days interval. 16.7% farmers farmers irrigate the field at every 15 days interval and 3.3% farmers irrigate the field at every 20 days interval.

Pruning

The results are presented in table no.13

During this survey it is observed that 96.7% people prune the leaves and branches for the better growth of plants and 3.3% farmers does not prune the crop.

Mango Fruit Borer attack

The results are presented in table no.14

During this survey it was noted that all mango orchards selected in this study were attacked by mango fruit borer.

From How Many Years attack of MFB observed?

The results are presented in table no.15

According to16.7% of farmers believe that mango fruit borer damage was appeared 2 years ago while 40% believe that this pest appears 3 years ago and 43.3% believe that mango fruit borer appears 4 years ago.

Affected Stage

The results are presented in table no.16

During this conducted survey it is observed that mostly people 73.3% think that MFB attacked on mango during fruiting stage. While 26.7% peopkle think that it mostly attacked on malformation which remains in orchard.

Critical month for MFB Attack

The results are presented in table no.17

During this survey it is observed that 40% farmers believe that April-May is most critical month for the attack of MFB attack while 26.7% believe that this pest damage more in the month of March-April while 26.7% people think that its attack reached on Peak during May-June. Also 6.7% people think that its attack duration is mostly March-May.

Management Practices Adopt by Farmers to Control MFB

The results are presented in table no.17

During this survey it is observed that 76.7% people used chemical to control MFB. While only 26.3% peoples used different techniques to control tha attacked of MFB attack in Mango orchards.

Which chemical is mostly used by Farmers

The results are presented in table no.18

During this survey it is observed that 30% people used Bifenthrin to control Mango Fruit Borer attack in mango orchards while 20% people used Emmam ectin Benzoate, 6.7% use the Tricks, 6.7% use talstar, 10% use other pesticides to prevent the attack of MFB in orchards. 26.7% growers does not know which pesticide they use against the pest. This factor again showed interaction between education and farming practices. In previous tables it was indicated that 40% growers were illitrate so they don,t know which pesticide should be use against mango fruit borer.

Table 10. Distribution of Mango farmers regarding their Sale Market.

	Frequency	Percent	Valid Percent	Cumulative Percent
Local	21	.70	70	70
Exporter	9	30	30	100.0
Total	30	100.0	100.0	

Table 11. Distribution of Mango farmers regarding their Fertilizer use.

	Frequency	Percent	Valid Percent	Cumulative Percent
Urea	19	63.3	63.3	63.3
FYM	11	36.7	36.7	100.0
Total	30	100.0	100.0	

Table 12. Distribution of Mango farmers regarding irrigation.

Days interval	Frequency	Percent	Valid Percent	Cumulative Percent
4	1	3.3	3.3	3.3
7	20	66.7	66.7	70.0
8	3	10.0	10.0	80.0
15	5	16.7	16.7	96.7
20	1	3.3	3.3	100.0
Total	30	100.0	100.0	

Table 13. Distribution of Mango farmers regarding Pruning.

Pruning	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	29	96.7	96.7	96.7
No	1	3.3	3.3	100.0
Total	30	100.0	100.0	

Table 14. Distribution of Mango farmers regarding MFB damage.

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	30	100.0	100.0	100.0

Table 15. Distribution of Mango farmers regarding Years of MFB damage.

Years	Frequency	Percent	Valid Percent	Cumulative Percent
2	5	16.7	16.7	16.7
3	12	40.0	40.0	56.7
4	13	43.3	43.3	100.0
Total	30	100.0	100.0	

Table 16. Distribution of Mango farmers regarding Affected Stage.

	Frequency	Percent	Valid Percent	Cumulative Percent
Fruiting	22	73.3	73.3	73.3
Malformation	8	26.7	26.7	100.0
Total	30	100.0	100.0	

Table 17. Distribution of Mango farmers regarding Month of damage .

Months	Frequency	Percent	Valid Percent	Cumulative Percent
	8	26.7	26.7	26.7
April-may	12	40.0	40.0	66.7
May-jun	2	6.7	6.7	73.3
March-jun	8	26.7	26.7	100.0
Total	30	100.0	100.0	
	Frequency	Percent	Valid Percent	Cumulative Percent
Chemical	23	76.7	76.7	76.7
Others	7	23.3	23.3	100.0
Total	30	100.0	100.0	

Table 18. Distribution of Mango farmers regarding Chemical usage.

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Bifenthrin	9	30.0	30.0	30.0
Emmamectin	6	20.0	20.0	50.0
Tricks	2	6.7	6.7	56.7
Talstar	2	6.7	6.7	63.3
Other	3	10.0	10.0	73.3
Don,t know	8	26.7	26.7	100.0
Total	30	100.0	100.0	

Table 19. Distribution of Mango farmers regarding Month of damage Host Plant.

	Frequency	Percent	Valid Percent	Cumulative Percent
No	30	100.0	100.0	100.0

Table 20. Distribution of Mango farmers regarding Pest Infestation.

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Sindhri	18	60.0	60.0	60.0
Chaunsa	6	20.0	20.0	80.0
Mosmi	2	6.7	6.7	86.7
Doseri	3	10.0	10.0	96.7
Anwar	1	3.3	3.3	100.0
Total	30	100.0	100.0	

Table 21. Distribution of Mango farmers regarding Damage Percentage.

%	Frequency	Percent	Valid Percent	Cumulative Percent
1-25	30	100.0	100.0	100.0

Most Susceptible Varities

According to 60% farmers the most suceptible variety was sindhri while 20% believe that chanusa variety was most suceptible variety, 6.7% believe that mosami was suceptibel variety, 10% believe that Duseheri and 3.3% believe that Anwar Ratool is most suceptible variety.

Damage Percentage

During this survey it is observed that all people think that MFB damage mango in the range of 1-25%.

Discussion

The study was conducted to determine the perception of mango grower about fruit borer in mango. The varied response of mango growers was obtained about practices adopted at farm. Trend in the age distributions implied that majority of the farmers were in their active age. Higher rate of young farmers involved in fruit crop production is a good sign for the horticulture industry in Pakistan. Increased and sustainable fruit crop production can therefore be enhanced if many of these young farmers would become members of the functional farmer-based associations in the area. The result indicated that 26.7% respondent were at the age of 20-40 years while 66.7% were at the age of 41-60 years. Survey regarding educational background indicated that most of the fruit growers were illiterates 40% followed by 23% and 13% matric, only 23% were graduate. Existing literature shows that improved crop production requires high level of expertise from farmers in order to implement effectively the recommended practices (Crosby *et al*., 2000). Madisa *et al.* (2010) observed that educated farmers are generally more open to innovative ideas and new technologies that promote positive change. It has been asumed that 40% growers included in survey were illitrate and 33.3% of these farmers are earning minimum income per anum and 7% have graduate level of education and 6% of them are getting maximum earning. So eduation is prime factor which play key role in increasing the income of growers. In this study majority of farmers have 43.3% have 13-25 acres and only 3% have more than 100 acres. During this survey mostly orchards are on Fruiting stage 66.7 % (20) while non Fruiting stage orchards are represent 33.3%(10). During this survey it is observed that 63.3% mango grower used Urea as a fertilizer in Mango orchard. While 36.7% grower used different fertilizer combination like FYM, Potash etc for the better growth of Mango plants. During this survey it is also observed that 3.3% farmers irrigate the field after every 4 days interval 66.7% people irrigate the

orchard after every 7 day interval. 10% irrigate the field after every 8 days interval. 16.7% farmers farmers irrigate the field at every 15 days interval and 3.3% farmers irrigate the field at every 20 days interval. During this survey it is noted that in Multan following varities of Mango are present. These varities are Sindhri, kala chaunsa, white chaunsa, S.B chaunsa, Nawab puri, Fegri, Langra, Doseri, Anwar ratool and Ratool 12. During this survey it was noted that all mango orchards selected in this study were attacked by mango fruit borer. According to16.7% of farmers believe that mango fruit borer damage was appeared 2 years ago while 40% believe that this pest appears 3 years ago and 43.3% believe that mango fruit borer appears 4 years ago.

During this conducted survey it is observed that mostly people 73.3% think that MFB attacked on mango during fruiting stage. While 26.7% peopkle think that it mostly attacked on malformation which remains in orchard. During this survey it is observed that 40% farmers believe that April-May is most critical month for the attack of MFB attack while 26.7% believe that this pest damage more in the month of March-April while 26.7% people think that its attack reached on Peak during May-June. Also 6.7% people think that its attack duration is mostly March-May. During this survey it is observed that 76.7% people used chemical to control MFB. While only 26.3% peoples used different techniques to control tha attacked of MFB attack in Mango orchards.

During this survey it is observed that 30% people used Bifenthrin to control Mango Fruit Borer attack in mango orchards while 20% people used Emmam ectin Benzoate, 6.7% use the Tricks, 6.7% use talstar, 10% use other pesticides to prevent the attack of MFB in orchards. 26.7% growers does not know which pesticide they use against the pest. This factor again showed interaction between education and farming practices. In previous tables it was indicated that 40% growers were illitrate so they don,t know which pesticide should be use against mango fruit borer. During this survey it is observed that People don,t observed any host plant of this pests in any other Hosts. According to 60% farmers the most suceptible variety was sindhri while 20% believe that chanusa variety was most suceptible variety, 6.7% believe that mosami was suceptibel variety, 10% believe that Duseheri and 3.3% believe that Anwar Ratool is most suceptible variety. During this survey it is observed that all people think that MFB damage mango in the range of 1-25%. Although Pakistan is a leading mango producer (FAO, 2007).

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References

Anderson S, Tran-Nguyen L. 2012. Mango fruit borer (*Citripestis eutraphera*) updated on 2/24/2012 7:20:30 PM Available online: PaDIL-www.padil.gov.auZhang, 2009.

Bhusal SJ. 2005/2006. Insect pest complex of Mango fruit in Koshi East Terai Region, Annual Report RARS, Tarahara pp. 62-65.

Crosby CT, De Lange MM, Stimie CM, VanDer SI. 2000. A review of planning and design procedures applicableto smallholder farmer irrigation projects. WRC Report No. 78/2/00. Water Research Commission, Pretoria, South Africa. Hidayah BN, Rahayu M, Mujiono, Thistleton B, Qureshi S, Baker I, Effectiveness of Pesticides in Controlling Major Pest and Disease of Mangoes in West Nusa Tenggara Province – Indonesia, 3rd International Conference on Chemical, Biological and Environment Sciences (ICCEBS'2013) January 8-9, 2013 Kuala Lumpur (Malaysia), pp 53-55.

Khan D, Shaukat SS. 2006. The fruits of Pakistan: Diversity, distribution, trends of production and use. International Journal of Biology and Biotechnology **3(3),** 463-499.

Krull SME. 2004. Studies on the mango-ecosystem in Papua New Guinea with special reference to the ecology of *Deanolis sublimbalis* Snellen (Lepidoptera, Pyralidae) and to the biological control of Ceroplastesrubens (Homoptera, Coccidae). Ph D. Thesis, Institut fur Phytopathologie und Angewandte Zoologie der Justus-Liebig-Universitat Gieβen, Versuchsstation, Alter Steinbacher Weg 44, Gieβen.

Madisa ME, Assefa Y, Obopile M. 2010. Assessment of production constraints, crop and pest management practices in peri-urban vegetable farms in Botswana. Egyptian Academic Journal of Biological Sciences **1(1),** 1-11.

Mainali B P, Ojha M.2000/2001. Management of Mango Stem Borer, Annual Report RARS, Tarahara pp. 61-62.

Salem SA, Abd-El Salam AME. 2013. Field evaluation and efficacy of different natural and sex attractant traps for attracting the adults of med and peach flies, *Ceratitis capitata* (Wied.) and Bactrocera zonata (Saunders). Canadian Journal of Plant Protection **1(5),** 167-171.

Sruamsiri S, Silman P. 2009. Nutritive value and nutrient digestibility of ensiled mango byproducts. Maejo. Int. J. Sci. Technol **3(3),** 371-378. Surveillance on Population Dynamics and Fruits Infestation of Tephritid Fruit Flies (Diptera: Tephritidae) in Mango (*Mangifera indica* L.) Orchards of Faisalabad, Pakistan

Vayssieres JF, Sinzogan A, Adandonon A. 2008. The new invasive fruit fly species, Bactrocera invadens Drew Tsuruta and White. IITACIRAD Leaflet No. 2. p 4.

Waterhouse DF. 1993. The major arthropod pests and weeds of agriculture in Southeast Asia'. (ACIAR: Canberra).