



PERCEPTION OF MANGO FARMERS ON THE STATUS OF *CONOGETHES PUNCTIFERALIS*

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ABSTRACT

The current study explores the knowledge, attitude and practices (KAP) of Pakistani mango farmers about mango fruit borer (*Conogethes punctiferalis*) and also evaluates management practices. The majority of the farmers were the owners of mango orchards and 72.5, 79.16, 75, and 70.83% of farmers in Khanewal, Multan, RYK, and Muzaffar Garh, respectively used the practices. The majority of farmers pruned their orchards regularly. Furthermore, 88.33% of farmers consulted the Agriculture Extension Agent/Extension department. The removal of weeds reduced the pest as responded to by a majority of farmers. It was observed that 78.33% of farmers in district Khanewal believed that fruit borer attacks on fruits, and only 1.66% of farmers were unaware of which part of mango is attacked; while 4.16% of farmers thought it attacks the leaves. 41.66, 40, 40.83, and 38.33% of farmers used emamectin in Khanewal, Multan, RYK, and Muzaffar Garh, respectively. Farmers thought that Anwar Ratool was the most susceptible variety while Chaunsa looked resistant. In Muzaffar Garh, the Anwar Ratool was the more highly infested variety. It was observed that the majority of the farmers believed that *C. punctiferalis* caused 25% yield loss and only 5.83-15.83% of farmers believed that it caused 100% loss.

Key words: *Mangifera indica*, *Conogethes punctiferalis*, farmers, industry, KAP, IPM, chemical control, ecofriendly, awareness, damage loss, management practice, yield loss

Mango (*Mangifera indica*), known as the king of fruits, is one of the most significant fruits cultivated in the world's tropical and subtropical countries, including India, Brazil, Pakistan, Mexico, Indonesia, Thailand, Philippines, China, and Bangladesh (Singh et al., 2014). Pakistan is the 2nd mango producer and 3rd exporter worldwide (Karar et al., 2019). Mango is amenable to biotic stresses induced by several pests, diseases, and pathogens like any other cultivated crop. Among the insect pests, mango borer, *Conogethes punctiferalis* (Guenee) (Lepidoptera: Crambidae) emerges as a challenging threat for the mango industry not only in Pakistan but also in other countries such as India, Australia, Vietnam and China (Chakravarthy et al., 2015; Kumar et al., 2018; Mutturaj et al., 2018; Gundappa et al., 2018; Tran et al., 2019; Bandaru et al., 2020). This pest inflicts severe damage by boring into mango fruits, resulting in diminished yields and

substantial economic losses. Upon hatching, larvae bore into the fruit at the apex or narrow tip, then make tunnels through the flesh and skin to feed on the seed. This leads to fruit spoilage and premature fruit drop, affecting mango production. The initial sign of infestation is the appearance of a sap stain emanating from the caterpillar's entry hole, which collects at the drip point at the fruit apex. Over time, this sap stain darkens and becomes highly noticeable (Singh et al., 2021; Magar et al., 2022).

The traditional reliance on chemical insecticides for pest control is increasingly proving less effective, primarily due to the pests' evolving resistance and growing concerns regarding environmental and health repercussions. Consequently, there's a rising interest in exploring and embracing alternative IPM, encompassing cultural practices, biological control practices, and

Table 1. Description of farmers and awareness on *C. punctiferalis*

Parameters	Khanewal	Multan	RYK	Muzaffar Garh
Age				
18-25	22	29	33	24
26-33	43	38	46	51
34-41	35	42	32	21
> 41	20	11	9	24
Qualifications				
Illiterate	7	5	10	13
Middle	36	38	44	40
Matric	43	47	41	35
Intermediate	19	22	20	21
Graduation	15	8	5	11
Marital Status				
Single	34	44	40	29
Married	86	76	80	91
Ownership				
Owner	50	53	51	54
Sharing	9	4	10	2
Tenant	61	63	59	64
Income/ acre PKRs				
10,000-60,000	30	37	42	36
60,000-80,000	56	54	49	52
80,000-120,000	20	17	19	23
Above 120,000	14	12	10	9
Mango cultivated area (acres)				
< 5	51	48	43	40
5 – 12.5	25	29	32	36
12.5 – 25	23	27	36	31
25 – 100	8	5	4	9
> 100	13	11	5	4
Practices adopted by mango farmers in orchards				
Irrigation				
2-3	0	0	0	0
4-6	4	3	5	1
6-9	46	50	47	50
> 9	70	67	68	69
Fertilizer				
Urea	87	95	90	85
Micronutrient	33	25	30	35
Pruning				
Regular	80	71	65	74
Occasionally	34	39	43	31
Never	6	10	12	15
Sanitation				
Removal of infested fruits	34	44	48	40
Weed removal	46	53	52	56
Bagging	10	5	6	3
Other	30	18	14	21
Source of information				
Conventional	4	6	7	5
Neighborhood	3	4	2	3

Extension Agent	55	52	47	54
Media	20	20	25	22
Private consultant	18	18	24	22
Pesticide company	20	20	15	14
Knowledge of mango farmers about <i>C. punctiferalis</i>				
Do you have information about <i>C. punctiferalis</i> ?				
Yes	75	70	77	80
No	35	50	43	40
Do you know the infestation symptoms of <i>C. punctiferalis</i> ?				
Yes	76	79	73	72
No	34	41	47	48
Which is a highly affected part by <i>C. punctiferalis</i> ?				
Flowering	11	9	8	10
Fruits	94	92	96	91
Shoot	8	9	6	9
Leaves	5	8	7	9
Don't know	2	2	3	1
Is there any alternative host plant for <i>C. punctiferalis</i> ?				
Yes	69	63	55	47
No	45	50	61	65
Don't know	6	7	4	8
Are you aware of the negative effects of insecticide?				
Yes	97	91	90	93
No	23	29	30	27
Are you aware of management approaches like IPM for <i>C. punctiferalis</i> ?				
Yes	81	77	80	74
No	39	43	40	46
Which control method is used to control <i>C. punctiferalis</i> in your orchards?				
Physical	3	10	22	29
Cultural	46	40	35	33
Mechanical	2	1	1	0
Biological	0	0	0	0
Botanical	3	5	3	2
Chemical	56	53	50	51
IPM	10	11	9	5
Which insecticide is used to control <i>C. punctiferalis</i> in your orchards?				
Emamectin	50	48	49	46
Bifenthrin	43	40	39	41
Others	17	21	20	18
Don't know	10	11	12	15
How many chemical sprays have you used in your orchards ?				
1-2	47	45	49	51
3-4	55	53	55	50
5-6	18	21	14	19
> 6	0	1	2	0

utilization of biopesticides. There is a noticeable gap in the available information concerning the awareness and perceptions of Pakistani mango farmers regarding the pest's prevalence and the current management practices. Gaining insights into the farmers' perspectives is imperative for devising IPM strategies. This study is geared toward evaluating the level of knowledge and perception among Pakistani mango farmers concerning the pest status of *C. punctiferalis* and the contemporary practices employed for its management. Earlier reports have indicated that mango yield can be increased through breeding methods and IPM (Singh et al., 2018; Venkata et al., 2018). It is imperative to conduct surveys and gather data from mango farmers to identify the primary production restrictions that influence mangoes on smallholder farms, particularly those affected by *C. punctiferalis*.

MATERIALS AND METHODS

A survey was conducted in the four different districts of Punjab, Pakistan i.e. Khanewal, Multan, Rahim Yar Khan (RYK), and Muzaffar Garh. From each district, 120 mango growers (farmers) were selected randomly and the interview was conducted using a questionnaire consisting of knowledge, attitude, and practice-related questions. Interviews were conducted in the orchards or at the farmers' homes in their free time. Every farmer was given a 20-30- min interview. Before the interview began, the farmers were informed of the research study's purpose. The survey data were entered into Excel sheets, and SPSS software was used to calculate the frequency distribution.

RESULTS AND DISCUSSION

Mango fruit borer *C. punctiferalis* has been declared the major pest of mango orchards. In the last few years, *C. punctiferalis* has become a serious issue for the mango industry, becoming hurdles in the export and import of mango (Chethan et al., 2017; Stanley et al., 2018; Yatish et al., 2018; Ballal et al., 2018; Lalruatsangi, 2022; Zhang et al., 2023). The mango growers did not differentiate the immature stages from other pests such as fruit flies and the fruit borer (*Citripestis eutraptera*) due to their similar damage pattern. The majority of farmers were the owners of mango orchards that pruned them regularly. In Khanewal, Multan, RYK, and Muzaffar Garh, 72.5, 79.16, 75, and 70.83% of farmers used urea to get maximum mango production. Furthermore, 16.66% of farmers learned about borers from pesticide dealers or the media. The farmers responded that borer infestation

can be minimized through weed removal. It was observed that 78.33% of farmers in district Khanewal believed that mango fruit borer attacks on fruits, and only 1.66% of farmers don't know which part of mango is attacked by pest, while 4.16% of farmers thought it attacks the leaves. Insecticides were the main solution to get rid of this pest (Chethan et al., 2016). 41.66, 40, 40.83, and 38.33% of farmers used emamectin to control the *C. punctiferalis* in Khanewal, Multan, RYK, and Muzaffar Garh, respectively. This insecticide could be used to control this noxious pest at the early stage (1-2nd instars) (Chethan et al., 2016; Kim et al., 2022). Patel and Borad (2016) reported chlorantraniliprole as the most effective on castor in India. In all districts, farmers thought that Anwar Ratool was the most susceptible variety, while Chaunsa looked resistant due to the lowest damage. It was observed that the majority of the farmers believed that *C. punctiferalis* caused 25% yield and only 5.83-15.83% of farmers believed that it caused 100% losses.

AUTHOR CONTRIBUTION STATEMENT

MAM planned and designed the study. MR performed analysis and wrote the manuscript and MAM helped in writing. DA, FU, RS, ABS, MH, and NA critically reviewed and revised the manuscript.

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CONFLICT OF INTEREST

No conflict of interest.

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