Original Research Article

SURVEY OF MELON FRUIT FLY, *Zeugodacuscucurbitae*(COQUILLETT)INFESTATION ON CUCURBITS IN DHARWAD AND HAVERI DISTRICTS OF KARNATAKA, INDIA

ABSTRACT

The roving survey was undertaken in and around Dharwad and Haveri districts,covering major cucurbits growing areas, during August and October, 2019 to assess the present status of melon fruit fly,*Zeugodacuscucurbitae*infestation on different cucurbits in farmer fields. It revealed that higher mean per cent infestation was recorded on bitter gourd (37.59 %) crop followed by ridge gourd (32.67 %), cucumber (28.84 %), and bottle gourd (20.48 %) during August in Dharwad district as compared to Haveri district. Further, in the month of October, the same trend was followed among the following cucurbits. Where, bitter gourd recorded the highest per cent infestation of at 35.30per cent followed by ridge gourd (30.05 %), cucumber (27.02 %) and bottle gourd (18.65 %) in Dharwad as compared to Haveri district. Thus, results showed that higher melon fruit fly infestation was noticed in August over October in Dharwad as compared to Haveri district.

Key words: Survey, cucurbits, Infestation, Melon fruit fly,

INTRODUCTION

Cucurbits are the largely grown crops among the vegetables, which includes cucumber, musk melon, water melon, pumpkin and gourds like bitter gourd, bottle gourd, sponge gourd, ash gourd and ridge gourd. In India total production of these cucurbits was 1050.10 (000 Tonnes) (Anon, 2018).

Main constraint for the production of these cucurbits was insect pests and diseases, among these pests, fruit flies plays key role in causing the loss in these cucurbits. The family tephritidae, commonly known as fruit flies, have great economic importance. At present 4352 species in 483 genera are known around the world. This involves the most important pest of fruits and vegetables. In India, only 200 species of 71 genera is known (Kapoor, 2010). The melon fruit fly, *Zeugodacuscucurbitae*(Coquillett)belongs to the family tephritidae of the order diptera, attack on more than 81 hosts. They are major pests of Chinese wax gourd beans, bitter gourd, tomatoes, cucumbers, edible gourds, eggplant, green beans, peppers, melons, squashes, pumpkins, watermelon (Dhillon *et al*., 2005).

However, the melon fly damages the crop by ovipositing on the fruits, and then maggots start feeding on the flesh which in turn causes decomposition of plant tissue by the invasion of secondary microorganisms. Most damage of fruit caused by maggots feeding, adult fly prefers to infest young, soft-skinned fruits even before maturation.

Whereas, the *Z. cucurbitae* is considered as a quarantine pest due to its highly invasive nature and causes more infestation on many fruits and vegetables. These fruit flies are considered as the major limiting factor in obtaining good quality and higher yield of cucurbit fruits and their attack not only reduces the yield but also reduces the quality of fruits, due to this, the crop marketability get affected and rendered unprofitable to the vegetable growing enterprise (Allwood, 1997). Knowing this back ground following study of survey of melon fruit fly infestation on the major cucurbits like ridge gourd, bitter gourd, bottle gourd and cucumber was carried out in Dharwad and Haveri Districts during 2019-20 in *Kharif* season.

MATERIALS AND METHODS

The present investigation on roving survey was carried out in2019 in August and October in Dharwad and Haveri districts of Karnataka for checking the incidences of melon fruit fly. In each district, three talukas such as Ranebennur, Byadgi, and Hirekerur of Haveri district and Dharwad, Kalghatgi and Hubballi talukas of Dharwad district were selected and, in each taluka, based on the availability of cucurbitscrops, villages were selected and in each village two farmer fields of cucumber, bottle gourd, bitter gourd and ridge gourd were surveyed. In each field, tenplants of the selected cucurbitaceous crop were randomly selected, respectively.

Observations recorded:observed for infestation of fruit fly by counting the total number of fruits produced and number of fruits infested and later it converted into per cent fruit infestation of selected cucurbit crops by using the below given formula by Pankaj *et al*. (2005.

$$\text{Per cent fruit infestation} = \frac{\text{Number of fruits infested}}{\text{Total number of fruits produced}} \times 100$$

RESULTS

At Dharwad district:

Roving survey on ridge gourd results revealed that the higher mean per cent infestation by melon fruit fly was noticed in Dharwad taluka (35.31%), followed by Hubballi (32.79%) and Kalaghatgi Taluka (29.92%) in August. Whereas during October again Dharwad taluka recorded higher mean per cent infestation of 33.12, followed by Hubballi (29.94%) and Kalaghatgi taluka (27.07%), respectively.

Similarly, the results obtained upon survey on cucumber revealed that the higher mean per cent infestation was noticed in Dharwad taluka (31.52%), followed by Hubballi (28.80%) and Kalaghatgi Taluka (26.20%) in August. Whereas during October again Dharwad taluka recorded higher mean per cent infestation of 30.34, followed by Hubballi (27.11%) and Kalaghatgi taluka (23.62%).

In various taluk surveyed, the higher mean per cent infestation was noticed in Hubballi taluka (39.17%), followed by Dharwad (36.85%) and Kalaghatgi taluka (36.75%) in August. Whereas during October again Hubballi taluka recorded higher mean per cent infestation of 37.54, followed by Dharwad (34.58%) and Kalaghatgi taluka (33.78%) was recorded during the survey of melon fruit fly infestation on bitter gourd.

During the survey on bottle gourd, the higher mean per cent infestation was noticed in Hubballi taluka (21.52%), followed by Kalaghatgi taluka (20.44%) and Dharwad (19.47%) in August. Whereas, during October again Dharwad taluka recorded higher mean per cent infestation of 18.96, followed by Hubballi (18.68%) and Kalaghatgi taluka (18.30%).

At Haveri district:

Among the various taluk surveyedfor infestation of melon fruit fly on ridge gourd results revealed that the higher mean per cent infestation was noticed in Ranebennur taluka (26.86%), followed by Hirekerur taluka (26.21%) and Byadgi (23.82%) in August. Whereas, during October again Hirekerur taluka recorded higher mean per cent infestation of 24.82, followed by Ranebennur (23.03%) and Byadgi taluka (22.81%).

The results obtained upon survey on cucumber revealed that the higher mean per cent infestation was noticed in Ranebennur taluka (23.44%), followed by Byadgi taluka (22.62%) and Hirekerur (20.58%) in August. Whereas, during October again Ranebennur taluka recorded higher mean per cent infestation of 21.58, followed by Byadgi (21.36%) and Hirekerur taluka (18.71%).

Higher mean per cent infestation was noticed in Hirekerur taluka (36.95%), followed by Byadgi taluka (34.36%) and Ranebennur (32.07%) in August. Whereas, during October again Hirekerur taluka recorded higher mean per cent infestation of 33.81, followed by Ranebennur (30.72%) and Byadgi taluka (28.81%)was recorded during the survey of melon fruit fly infestation on bitter gourd.

During a roving survey on bottle gourd for fruit fly infestation. The higher mean per cent infestation was noticed in Hirekerur taluka (20.11%), followed by Byadgi taluka (18.61%) and Ranebennur (17.24%) in August. Whereas during October again Hirekerur taluka recorded higher mean per cent infestation of 18.36, followed by Byadgi (15.84%) and Ranebennur taluka (15.65%).

Discussion

As per the data on infestation of fruit fly recorded during roving survey indicated that per cent fruit infestation of melon fruit fly was recorded higher when surveyed during August month as compared to October both in Dharwad and Haveri districts, this might be due to the higher rainfall received in August as compared to October both in Dharwad and Haveri districts, as melon fruit fly population may be positively correlated with high rainfall and high relative humidity, these weather factors create favourable environmental condition for insects growth. Fruit flies were highly active and fecundity was more in high rain fall and high relative humidity conditions prevailing in the atmosphere, respectively.

Based on the above data it can also be interpreted that among the cucurbits surveyed, bitter gourd recorded to be the highly infested cucurbit crop followed by ridge gourd, cucumber and bottle gourd. This trend had been followed both in August and October month in Dharwad and Haveri district, these results were in line with Dhillon *et al*., 2005 who reported that the fruit toughness and pericarp thickness was low in bitter gourd. However, fruit length, flesh thickness and fruit diameter were more.In which, it enables the melon fruit flies to penetrate their ovipositor easily into the fruit to lay eggs and maggots could be able to obtain food for longer period as flesh thickness was more in bitter gourd and it contains higher amount of reducing, non-reducing sugars, total proteins, ascorbic acid, nitrogen, phosphorous and less phenol content which was favourable for the well development of melon fruit fly maggots as compared to other selected cucurbits.

The present findings are in line with Manoj *et al*. (2017) who noticed the higher number of fruit flies catches (10.25/trap/day) was observed in bitter gourd as compared to bottle gourd (2.5/trap/day). Based on the number of fruit infestation Sohrab *et al.* (2018) reported that higher fruit infestation was noticed (8.50/trap/day) in bitter gourd followed by ridge gourd, pumpkin and bottle gourd. Laskar and Chatterjee (2010) reported that rainfall per day data showed positive correlation(r=+0.4367) with melon fruit fly incidence. Host preference study conducted by Shahzadi *et al*. (2019) reported that bitter gourd was the most preferred host followed by pumpkin, brinjal and cucumber.

The results of the survey also reveals that the per cent fruit fly infestation of selected cucurbits was higher in Dharwad district as compared to Haveri district as mentioned in the results. This might be due to most of the farmers in Haveri district grow these cucurbit crops with the great care under poly house condition as they cultivate for the seed purpose as compared to farmers in Dharwad district and also most of the farmers in Haveri district use insecticides like spinosad 45SC, cypermethrin, profenophos and combi product like Thiamthoxam+Lambda cyhalothrin 5% EC with 8 to 10 sprays along with bio stimulants like Isabion®, Spring® and Exfert®(protein based stimulant) from transplanting to till harvest of the crops, as these insecticide were moreeffective in managing the melon fruit fly as compared to the insecticides used by the farmers in Dharwad district like quinalphos 25% EC, dichlorovos 76% EC and chlorantraniliprole 20 SC along with only one bio stimulant *i.e.*Isabion® with 5 to 6 sprays only from transplanting to harvest of the crop. Further, in Haveri numberof traps installed per acre was 12 to 15. Whereas, in Dharwad district farmers

installed 8 to 10 traps per acre and also rainfall in Dharwad district was higher as compared to Haveri district.

The above results were in line with Sita *et al*. (2019) who reported that spinosad 45 SC was found superior over other insecticide among the trails in managing the melon fruit fly, where number of oviposition punctures per fruit and number of maggots per fruit was decreased as compared to other trails. Sunil *et al*. (2016) reported that insecticide which belongs to pyrithroid group like deltamethrin and cypermetrin found effective in managing the melon fruit fly as there was minimum fruit infestation and minimum number of maggots per fruit was observed as compared to other chemicals.

CONCLUSION

Based on the surveyed data it was concluded that higher melon fruit fly infestation was noticed in bitter gourd as compared to the other cucurbits surveyed and Dharwad district recorded the higher infestation as compared to the Haveri district.

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Table 1: District wisestatus of melon fruit fly,*Zeugodacuscucurbitae* infestation on cucurbits during August and October of 2019

District	Crop	% Infestation mean	
		August	October
Dharwad	Ridge gourd	32.67	30.05
	Cucumber	28.84	27.02
	Bitter gourd	37.59	35.30
	Bottle gourd	20.48	18.65
Haveri	Ridge gourd	25.63	23.55
	Cucumber	22.21	20.55
	Bitter gourd	34.46	31.11
	Bottle gourd	18.65	16.62

Table 2: Status of melon fruit fly,*Zeugodacuscucurbitae*infestation on Ridge gourd during August and October of 2019

District	Talukas	Villages	Infestation (%)		District	Talukas	Villages	Infestation (%)	
Dharwad	Dharwad		August	October	Haveri	Byadgi		August	October
		Alnavar	38.93	38.16			Anur	21.42	27.12
		Dasanakoppa	32.15	30.56			Bisalahalli	24.58	19.84
		Nigadi	34.85	30.65			Kollapur	25.47	21.47
		Mean	**35.31**	**33.12**			Mean	**23.82**	**22.81**
	Hubballi	Halyal	35.67	32.94		Hirekerur	Abalur	22.86	23.74
		Hebsur	30.84	31.58			Dammalli	27.64	24.86
		Ingalhalli	31.85	25.31			Hirebudihal	28.14	25.87
		Mean	**32.79**	**29.94**			Mean	**26.21**	**24.82**
	Kalaghatgi	Hirehonnihalli	32.75	25.62		Ranebennur	Ukkund	28.72	24.61
		Kalakundi	31.87	25.43			Sarvanda	29.37	21.75
		Ramanal	25.13	30.17			Yerekuppi	22.49	22.72
		Mean	29.92	27.07			Mean	26.86	23.03

Table 3: Status of melon fruit fly, *Zeugodacuscucurbitae*infestation on cucumber during August and October of 2019

District	Talukas	Villages	Infestation (%)		District	Talukas	Villages	Infestation (%)	
			August	**October**				**August**	**October**
Dharwad	Dharwad	Alnavar	28.54	27.35	Haveri	Byadgi	Anur	25.14	15.74
		Narendra	33.37	31.66			Bisalahalli	15.37	28.17
		Dasanakoppa	32.66	32.01			Kollapur	27.34	20.17
		Mean	**31.52**	**30.34**			Mean	**22.62**	**21.36**
	Hubballi	Halyal	25.31	25.84		Hirekerur	Abalur	22.95	14.65
		Hebsur	32.16	30.94			Dammalli	19.84	22.00
		Ingalhalli	28.94	24.56			Hirebudihal	18.94	19.47
		Mean	**28.80**	**27.11**			Mean	**20.58**	**18.71**
	Kalaghatgi	Hirehonnihalli	29.97	24.18		Ranebennur	Sarvanda	22.47	19.78
		Kadankoppa	25.17	22.37			Ukkund	25.41	25.31
		Mishrikot	23.45	24.31			Yettinahalli	22.45	19.64
		Mean	**26.20**	**23.62**			Mean	**23.44**	**21.58**

Table 4: Status of melon fruit fly, *Zeugodacuscucurbitae*infestation on Bitter gourd during August and October of 2019

District	Talukas	Villages	Infestation (%)		District	Talukas	Villages	Infestation (%)	
			August	**October**				**August**	**October**
Dharwad	Dharwad	Alnavar	35.46	34.12	Haveri	Byadgi	Kollapur	34.82	25.80
		Dasanakoppa	39.14	32.87			Shidenur	37.41	29.78
		Kalakeri	35.94	36.75			Bisalahalli	30.84	29.84
		Mean	**36.85**	**34.58**			Mean	**34.36**	**28.81**
	Hubballi	Anchatgeri	31.64	31.05		Hirekerur	Abalur	33.85	29.84
		Byahatti	42.65	39.71			Aralikatti	36.84	31.25
		Kusugal	43.22	41.87			Hirebudihal	40.16	40.35
		Mean	**39.17**	**37.54**			Mean	**36.95**	**33.81**
	Kalaghatgi	Bammigatti	31.02	40.21		Ranebennur	Ukkund	28.94	32.95
		Hirehonnihalli	45.03	32.95			Sarvanda	29.64	28.46
		Kalakundi	34.21	28.19			Yerekuppi	37.64	30.74
		Mean	**36.75**	**33.78**			Mean	**32.07**	**30.72**

Table 5: Status of melon fruit fly,*Zeugodacuscucurbitae*infestation on bottle gourd during August and October of 2019

District	Talukas	Villages	Infestation (%)		District	Talukas	Villages	Infestation (%)	
			August	**October**				**August**	**October**
Dharwad	Dharwad	Alnavar	19.64	17.35	Haveri	Byadgi	Anur	21.54	17.73
		Dasanakoppa	16.38	27.54			Bannihatti	18.34	16.95
		Kalakeri	22.38	12.00			Kollapur	15.94	12.85
		Mean	**19.47**	**18.96**			Mean	**18.61**	**15.84**
	Hubballi	Byahatti	27.16	21.63		Hirekerur	Abalur	19.84	17.31
		Ingalhalli	27.41	9.00			Dammalli	19.74	18.62
		Kusugal	10.00	25.41			Suttukote	20.75	19.15
		Mean	**21.52**	**18.68**			Mean	**20.11**	**18.36**
	Kalaghatgi	Aladakatti	18.95	20.74		Ranebennur	Halageri	12.64	18.34
		Hirehonnihalli	25.68	15.84			Kakol	20.45	13.67
		Kalakundi	16.70	18.31			Kuppelur	18.64	14.95
		Mean	**20.44**	**18.30**			Mean	**17.24**	**15.65**