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Relative Preference of Mango Hopper Species on Different Mango Varieties in Chhattisgarh Plain

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ABSTRACT: The relative preference of mango hopper species on different varieties of mango were recorded at Horticulture Research Farm, BTC, College of Agriculture and Research Station, Indira Gandhi Krishi Vishwavidyalaya, Bilaspur (C.G.). Twelve varieties of mango namely Langra, Sundarja, Amrapali, Mallika, Payari, Totapari, Krishnabhog, Sinduri, Barahmashi, Neeleshan, Nileshwari and Kesar were screened for mango hoppers (*Amritodus atkinsoni* Lethierry) under study. On the basis of overall mean of two years, the least preferred varieties by mango hoppers were Mallika (10.26/panicle) and Sundarja (10.71/panicle) followed by Totapari (11.68/panicle) and Sinduri (12.46/panicle). Whereas, maximum preferred varieties were Nileshwari (131.57/panicle) followed by Kesar (99.94/panicle), Neeleshan (75.02/panicle) and Amrapali (68.01/panicle).

Keywords: Mango hopper, Mallika, *Amritodus atkinsoni*, Mango, entomopathogens.

INTRODUCTION

Mango (*Mangifera indica* L.) is the important fruit crop and known as king of all fruits and grown in different states of India and many countries over the world. India is top most producer of mango due to favorable soil and climatic conditions with a wide range of more than 1000 varieties (Srivastava,1998). Presently, in Chhattisgarh, the area under cultivation is decreasing day by day due to many factors. The main reason which affects the vitality and yield of mango is more than 50 insect-pests have been recorded causing damage to the crops among them mango hopper, scale insect, mealy bug, leaf gall, shoot borer, leaf miner, thrips, stone weevil, blossom webber, leaf webber, leaf eating caterpillar, leaf twister weevil, grey weevil, aphid and leaf eating looper round the year (Gundappa *et al*., 2019; Kaushik *et al*., 2012; Munj *et al*., 2020). During establishment of mango orchard it is most importance features to select varieties which showed tolerance or less infested by mango hopper because hopper is a major pest and causing serious yield losses upto 50% or more (Patel et al., 2004). Nymphs and adults of mango hoppers are serious pests especially during onset of inflorescence with new flush of vegetative leaves and lays eggs on inflorescence, petioles and tender leaves. Weather parameters play a vital role for occurrence of mango hopper and favourable climate create emerge population of hopper population and different strategies were applied for the management of hopper among them chemical pesticides (Nirmalkar *et al*., 2017) are major one but it's create toxicity of mango fruit and decreased soil and water contamination, reduced negative effects on non-target organisms including insect parasitoids, predators and major constrains during export rather than biological management strategies are more safer and cost effective i.e. entomopathogenic fungi (Nirmalkar *et al*., 2020). In Chhattisgarh province of India, two species of mango hoppers *Amritodus atkinsoni* Leth. and *Idioscopus clypealis* Leth. seen in mango orchard. The *Amritodus atkinsoni* Leth. is the most predominant species, (Kaushik *et al*., 2013). The The mango hoppers secrete honey dew from their body which encourages the development of fungi like *Meliola mangiferae* (Earle), resulting in growth of sooty mould on dorsal surface of leaves, branches and fruits. In case of severe attack, secretion (honey dew) trikles on the ground surface. Very little work has been done in Chhattisgarh plain towards mango hopper species infestation on different mango varieties. Keeping in view, the importance of the mango hopper problem and its damage, the study on mango hopper species on different varieties was carried out during flowering and fruiting season of mango.

MATERIALS AND METHODS

The relative preference of twelve varieties of 20 year old mango*viz;* Langra, Sundarja, Amrapali, Mallika, Payari, Krishanbhog, Sinduri, Barahmashi, Neeleshan, Nileshwari and Kesarwere selected for screening purpose. Two species of mango hoppers (*Amritodus atkinsoni* Lethierry and *Idioscopus clypealis* Lethierry) were under taken for study. Mango (*Mangifera indica* L.) were planted on 10 m × 10 m spacing at the Horticulture Research Farm, College of Agriculture and research station Bilaspur, Indira Gandhi Krishi Vishwavidyalaya, Chhattisgarh. The place is situated at a latitude and longitude of 22°06'21.1"N 82°08'32.9"E. Observations were made at fortnightly interval during 2017 and 2018. There are three trees of each variety in the orchard and one healthy tree was selected from each variety and tagging was done for easy identification under study. No insecticidal spray was given on the test trees during the course of investigation. From four branches of mango representing North, South, East and West directions were selected for recording the data. Again within each branch, five twigs of 10 c.m. long were chooses and tagged for counting the hopper population. The heights of marked shoots from ground level were 7 feet. The pest populations were recorded at the initiation of pest activity on inflorescence through bagging trap method as suggested by Varghes and Rao (1987). In this method the terminal part of inflorescence was covered with polythene bag (60 cm × 30 cm) provided with a cotton swab and soaked in 80 per cent ethyl acetate during the

morning hours between 6 - 9 AM for collecting the insects. The selected inflorescence twigs was inserted in to the bag and trapped gently so that the hopper including both nymphs and adults fall in it, later the hopper count was recorded by using the magnifying lens. Fortnightly averages of all parameters were calculated before their statistical analysis. The observation for mango hoppers was based on nymphs and adults population. Data were analyzed in randomized block design using square root transformation for interpretation of results as per formula suggested by Gomez and Gomez (1984) as given below :

$\sqrt{X + 0.5}$ (x = observed value, 0.5 as a common factor to remove zero)

RESULTS AND DISCUSSION

Significant differences on hoppers population per panicle were observed among the different varieties during 2017 season (Table 1). The average hoppers population counted at the fortnight interval for all the twelve varieties ranged from 10.03 to 94.58 per panicle. The minimum hoppers population was recorded in Mallika (10.03) followed by Sundarja (10.04), Totapari (12.22) and Sinduri (12.60). The maximum hoppers population was recorded under Nileshwari (94.58) followed by Kesar (85.63), Neeleshan (84.00) and Amrapali (75.33) varieties of mango. Hoppers population were recorded intermediate for remaining four varieties i.e., Langra, Krishnabhog, Barahmashi and Payari which were ranging from 34.39 to 31.53 nymphs and adult hoppers per panicle . During 2018, the average hoppers population counted per panicle at the fortnight interval for all the twelve varieties ranged from 10.50 to 168.56 per panicle. The minimum hoppers population was recorded in Mallika (10.50) followed by Totapari (11.15), Sundarja (11.39) and Sinduri (12.32). The maximum hoppers population recorded under Nileshwari (168.56) followed by Kesar (114.25), Neeleshan (66.04) and Amrapali (60.68). Hoppers population were recorded intermediate for remaining four varieties i.e., Langra, Barahmashi, Payari and Krishnabhog which were ranging from 36.50 to 28.74 nymph and adult hoppers per panicle . On the basis of pooled data (Table-3) hoppers population of first and second year, it may be stated that the variety Mallika and Sundarja were least preferred ones by mango hoppers with 10.26 and 10.71 nymph and adult hopper per panicle, respectively. Other varieties like Totapari (11.68) and Sinduri (12.46) having slightly higher population than Mallika and Sundarja. Maximum hopper population was observed in variety Nileshwari (131.57) followed by Kesar (99.94), Neeleshan (75.02) and Amrapali (68.01). Hopper population was recorded intermediate for remaining four varieties i.e., Langra (35.45), Barahmashi (33.99), Payari (31.44) and Krishnabhog (31.01). The reasons for variation of preference by hoppers may be anatomical, morphological, secondary metabolites or a combination of above all. Present findings conform to the findings of Khaire (1987), Singh (1997), Muzaffar *et al.* (2003), Gundappa and Shukla (2016), Sarode and Mohite (2019). Srivastava (1995) reported that mango varieties Amrapali and Neelum were highly susceptible while Langra and Sinduri considered susceptible and the variety Mallika were found less susceptible to mango hoppers under investigation. In consensus with the present results, Thangam *et al.* (2013); Munj *et al*., (2020); Kumar (2015) have reported that Mallika was resistant variety, Thangam *et al.* (2013); Karar and Bakhsh (2018) also reported Langra was less prefered and found hopper population (29.52) per inflorescences while Neeleshan was moderately preferred and Amrapali was highly susceptible to hoppers among tested variety.

Resilient varieties are one of the vital components of the pest management strategy which determine the success of Integrated Pest Management (IPM). Plants which are less susceptible to injury by insect pests are important for increasing yield and quality of crops. The practice of growing resistant varieties of agricultural crop is considered environmentally, naturally and economically beneficial. In this way the crop is saved from insect pest and yield can be protected without or minimum use of insecticides. Integrated Pest Management is considered one of the best practices which can keep insect pest injury population below levels of economic significance. Twelve assessed varieties for infestation of mango hoppers four varieties Mallika, Sundarja, Totapari and Sinduri considered as least infested by hopper while Nileshwari, Kesar, Neeleshan and Amrapali are most susceptible one.

Needed study on analysis of biochemical compositions of resistant and tolerant varieties response by hoppers.

Table 1: Mango hoppers population from 29.01.2017 to 21.05.2017.

S. No.	Mango variety	Hopper population /panicle									
		29/01/17	12/02/17	26/02/17	12/03/17	26/03/17	9/04/17	23/04/17	7/05/17	21/05/17	Mean
1.	Langra	17.58	22.42	29.25	39.03	53.99	57.90	49.71	27.92	11.75	34.39
		(4.25)	(4.78)	(5.45)	(6.29)	(7.38)	(7.64)	(7.07)	(5.33)	(3.49)	(5.74)
2.	Sundarja	1.50	2.79	4.58	10.65	19.42	23.04	17.58	10.58	0.17	10.04
		(1.41)	(1.81)	(2.25)	(3.33)	(4.46)	(4.85)	(4.25)	(3.32)	(0.81)	(2.94)
3.	Amrapali	50.08	62.92	83.38	97.42	101.25	107.38	93.42	55.58	26.58	75.33
		(7.11)	(7.96)	(9.15)	(9.89)	(10.07)	(10.37)	(9.66)	(7.45)	(5.18)	(8.54)
4.	Mallika	1.04	2.84	3.75	9.75	18.42	22.67	19.42	10.25	2.17	10.03
		(1.21)	(1.82)	(2.06)	(3.19)	(4.34)	(4.81)	(4.46)	(3.27)	(1.54)	(2.97)
5.	Payari	17.04	21.19	28.08	37.06	49.36	51.79	41.42	27.04	10.75	31.53
		(4.18)	(4.65)	(5.34)	(6.13)	(7.05)	(7.22)	(6.47)	(5.24)	(3.34)	(5.51)
6.	Totapari	1.75	3.50	5.25	11.42	21.25	27.08	23.38	14.58	1.75	12.22
		(1.50)	(2.00)	(2.35)	(3.42)	(4.62)	(5.23)	(4.84)	(3.83)	(1.44)	(3.25)
7.	Krishnabhog	15.04	25.58	28.94	36.75	48.69	56.92	48.82	27.75	11.08	33.29
		(3.91)	(5.09)	(5.41)	(6.10)	(7.01)	(7.57)	(7.02)	(5.31)	(3.40)	(5.65)
8.	Sinduri	2.00	3.75	5.42	12.63	25.28	29.08	21.42	13.08	0.75	12.60
		(1.58)	(2.06)	(2.42)	(3.61)	(5.07)	(5.44)	(4.68)	(3.68)	(1.05)	(3.29)
9.	Barahmashi	14.75	21.38	25.92	37.49	52.25	58.79	48.58	26.92	8.92	32.78
		(3.90)	(4.67)	(5.13)	(6.16)	(7.26)	(7.70)	(6.99)	(5.22)	(3.06)	(5.57)
10.	Neeleshan	48.61	69.62	82.11	100.32	115.04	127.25	111.75	73.75	27.58	84.00
		(7.00)	(8.36)	(9.08)	(10.03)	(10.73)	(11.29)	(10.56)	(8.59)	(5.30)	(8.99)
11.	Nileshwari	65.88	78.42	87.21	109.32	128.97	141.50	118.08	88.25	33.58	94.58
		(8.14)	(8.88)	(9.36)	(10.47)	(11.37)	(11.91)	(10.87)	(9.41)	(5.83)	(9.58)
12.	Kesar	59.46	69.29	80.75	100.58	123.25	132.58	103.11	73.75	27.92	85.63
		(7.74)	(8.35)	(9.01)	(10.05)	(11.12)	(11.53)	(10.16)	(8.60)	(5.32)	(9.10)
	Mean	24.56	31.97	38.72	50.20	63.09	69.66	58.05	37.45	13.58	43.05
	SEm±	0.15	0.16	0.15	0.14	0.20	0.17	0.29	0.31	0.22	0.12
	CD (5%)	0.45	0.48	0.45	0.43	0.59	0.52	0.87	0.93	0.66	0.35

Note: Figures in parentheses are Square root transformed value $(\sqrt{X + 0.5})$

Table 2: Mango hoppers population from 29-01-2018 to 21-05-2018.

S. No.	Mango variety	Hopper population /panicle									
		29/01/18	12/02/18	26/02/18	12/03/18	26/03/18	9/04/18	23/04/18	7/05/18	21/05/18	Mean
1.	Langra	16.04	23.42	27.95	39.70	52.90	58.42	47.88	37.08	25.08	36.50
		(4.07)	(4.88)	(5.33)	(6.33)	(7.30)	(7.66)	(6.94)	(6.11)	(5.04)	(5.96)
2.	Sundarja	1.75	2.88	7.04	20.12	21.29	23.33	19.04	6.92	0.17	11.39
		(1.50)	(1.82)	(2.70)	(4.54)	(4.66)	(4.88)	(4.42)	(2.71)	(0.81)	(3.12)
3.	Amrapali	46.58	55.08	64.30	74.18	78.92	90.79	67.44	45.58	23.25	60.68
		(6.86)	(7.45)	(8.04)	(8.63)	(8.90)	(9.54)	(8.21)	(6.74)	(4.87)	(7.69)
4.	Mallika	0.92	1.88	7.83	17.10	21.46	22.33	17.78	5.08	0.08	10.50
		(1.17)	(1.52)	(2.88)	(4.19)	(4.68)	(4.77)	(4.27)	(2.36)	(0.76)	(2.96)
5.	Payari	15.50	19.54	23.08	33.59	43.92	49.79	40.57	35.08	21.04	31.35
		(4.00)	(4.47)	(4.85)	(5.84)	(6.63)	(7.07)	(6.37)	(5.94)	(4.63)	(5.53)
6.	Totapari	1.17	2.38	8.58	19.11	22.08	23.29	17.38	6.25	0.08	11.15
		(1.26)	(1.67)	(3.01)	(4.43)	(4.74)	(4.87)	(4.22)	(2.59)	(0.76)	(3.06)
7.	Krishnabhog	20.21	20.21	23.68	31.12	40.67	48.88	37.04	24.75	12.08	28.74
		(4.55)	(4.55)	(4.91)	(5.61)	(6.40)	(7.01)	(6.10)	(5.00)	(3.52)	(5.29)
8.	Sinduri	1.75	3.38	9.25	21.42	23.57	26.29	19.54	5.58	0.08	12.32
		(1.50)	(1.96)	(3.12)	(4.68)	(4.90)	(5.17)	(4.45)	(2.46)	(0.76)	(3.22)
9.	Barahmashi	17.79	20.21	27.41	33.12	52.71	59.33	48.58	37.08	20.58	35.20
		(4.27)	(4.54)	(5.28)	(5.80)	(7.29)	(7.73)	(6.99)	(6.08)	(4.56)	(5.84)
10.	Neeleshan	55.38	57.67	69.39	80.25	84.78	94.79	71.42	52.08	28.58	66.04
		(7.47)	(7.62)	(8.35)	(8.98)	(9.22)	(9.74)	(8.47)	(7.25)	(5.38)	(8.05)
11.	Nileshwari	156.42	169.92	185.11	198.13	210.33	219.92	167.42	136.42	73.42	168.56
		(12.50)	(13.05)	(13.62)	(14.09)	(14.51)	(14.84)	(12.96)	(11.69)	(6.88)	(12.68)
12.	Kesar	100.17	113.79	137.13	152.96	141.05	147.46	116.38	81.25	38.08	114.25
		(9.99)	(10.66)	(11.70)	(12.36)	(11.81)	(12.08)	(10.73)	(8.92)	(8.55)	(10.76)
	Mean	36.13	40.86	49.22	60.06	66.13	72.05	55.87	39.43	20.21	48.49
	SEm+	0.28	0.24	0.25	0.19	0.32	0.31	0.30	0.37	0.52	0.23
	CD (5%)	0.82	0.72	0.76	0.58	0.95	0.92	0.89	1.11	1.53	0.70

Note: Figures in parentheses are Square root transformed value $(\sqrt{X+0.5})$

Table 3: Mean population of mango hopper.

S. No.	Mango variety	Hopper population /panicle		
		2017	2018	Mean
1.	Langra	34.39	36.50	35.45
		(5.74)	(5.96)	(5.85)
2.	Sundarja	10.04	11.39	10.71
		(2.94)	(3.12)	(3.03)
3.	Amrapali	75.33	60.68	68.01
		(8.54)	(7.69)	(8.12)
4.	Mallika	10.03	10.50	10.26
		(2.97)	(2.96)	(2.96)
5.	Payari	31.53	31.35	31.44
		(5.51)	(5.53)	(5.52)
6.	Totapari	12.22	11.15	11.68
		(3.25)	(3.06)	(3.15)
7.	Krishnabhog	33.29	28.74	31.01
		(5.65)	(5.29)	(5.47)
8.	Sinduri	12.60	12.32	12.46
		(3.29)	(3.22)	(3.25)
9.	Barahmashi	32.78	35.20	33.99
		(5.57)	(5.84)	(5.70)
10.	Neeleshan	84.00	66.04	75.02
		(8.99)	(8.05)	(8.52)
11.	Nileshwari	94.58	168.56	131.57
		(9.58)	(12.68)	(11.13)
12.	Kesar	85.63	114.25	99.94
		(9.10)	(10.76)	(9.93)
	Mean	40.03	48.89	44.46
	SEm+	0.12	0.23	0.14
	CD (5%)	0.35	0.70	0.41

Note: Figures in parentheses are Square root transformed value $(\sqrt{X+0.5})$

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