

Evaluation of Hopper Incidence on Different Varieties of Mango in North - Eastern Transition Zone of Karnataka

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ABSTRACT

The leaf hopper is Based on the varietal observation the least number of the hoppers were observed on Mallika, Baneshan and Totapari. The varieties like Raspuri, Langra and Kesar were infested by moderate number of leafhoppers. The leafhoppers mean population were highest during the fruiting period in the varieties such as Dasher, Mulgoa, Neelum and Alphanso. During 2015-16, the excluding Alphanso, Neelum and Mallika, the weather parameters like maximum and minimum temperature displayed significantly positive correlation for leafhoppers population with $r=0.60$ to 0.77 and $r=0.50$ to 0.67 respectively. Similarly, many varieties, the relative humidity (both maximum and minimum) displayed negative significant correlation ($r=-0.50$ to -0.66) except Neelum, Mallika, Dasher and Langra varieties. During second year 2016-17, excluding Mallika, Neelum and Alphanso, remaining varieties showed significant positive correlation with minimum temperature ($r=0.52$ to 0.70). In contrary against all the variety minimum RH showed significantly negative correlation ($r=-0.57$ to -0.71) and maximum RH showed significant negative correlation in Totapari ($r=-0.69$), Mulgoa ($r=-0.62$), Baneshan ($r=-0.68$), Dasher (-0.58) and Langra (-0.63), but no such relations were observed in other varieties.

Keywords: Leafhoppers, mango, varieties, population dynamics, weather parameters, N-E Karnataka.

INTRODUCTION

The crop mango is called as King of fruits and it a national fruit of India. The crop is widely distributed and in temperate region it is similar to apple. There are nearly 1000 different mango varieties cultivating across India with different shape, size and taste (Singh, 1990; &

Anant, 2016). On these varieties around 250 insect and mite pests been attacked, among them mango hoppers, stem borer, mango stone weevil, fruit fly, leaf webber, defoliator, blossom webber, leaf gall fly, scales and mealy bugs causes severe damage to mango tree (Pena & Mohyuddin, 1997).

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Later the pest complex increased to 492 species (Tandon & Verghese, 1985). Among the pests complex the leafhoppers are more economically important (Gangolly et al., 1957) causing damage from 20 to 100 per cent inflorescence loss. The nymphs of hoppers cause more damage compared to adults during vegetative as well as reproductive stages of the mango tree. More number of young ones and adults of the hoppers gather on the basal part of the trunk and puncture tender shoots, inflorescences and leaves of mango tree, then suck the sap (Tandon & Verghese, 1985; Pingale & Patil, 1988; Rahman & Kuldeep, 2007; & Kaushik et al., 2014). Other than the direct damage, leafhoppers ooze honeydew, which promote the growth of black sooty mold (*Capnodium mangiferae* Ek.), hence badly affecting the photosynthetic activity of the plant. That results in non-setting of flowers and dropping of immature fruits, ultimately resulting in yield loss. On the mango trunk, the leafhoppers remain active throughout the year in cracks and crevices and the harmed panicles do not set the fruit (Haseeb, 2006; Rahman & Kuldeep, 2007; & Kaushik et al., 2014). Old mango trees were more susceptible to hopper damage than young trees (Kannan & Rao, 2006).

The pest severity and infestation, abundance is also influenced by various environmental factors along with plant resistance or varietal characters (Dhaliwal & Singh, 2004; & Kaushik et al., 2014). To develop suitable management strategies, it is fundamental necessary to have knowledge on the pest abundance, distribution and varietal influence is essential. In this experiment, we made an endeavour to study the different cultivars of mango and their influence on the activity of the leafhoppers in North-Eastern region of Karnataka.

MATERIALS AND METHODS

The field trial for the evaluation of mango varieties against leafhoppers was conducted during 2015-16 and 2016-17, at the research farm of College of Horticulture, Bidar. Bidar is a climatically coldest and wettest distinct

and it comes under the Southern plateau and hills Region with gravelly red clayey soil types developed on plateaus of laterites. The mean annual rainfall is 911.6 mm, mean high temperature during the hottest months of June is 44.0°C. The January month is the coldest month with the mean minimum temperature of 6.2°C.

Mango cultivars used

Total ten varieties and hybrids of mango viz., Alphanso, Raspuri, Totapuri, Mulgoa, Neelum, Mallika, Dasherri, Langra, Baneshan and Kesar were studied under unprotected condition.

Observations on fruit damage by leafhoppers

The observation on leafhopper present both at off-season and on-season on leaf, flower and inflorescence was recorded at fortnightly interval starting from the mid of December to till first fortnight of May in both the season. Cumulative per cent species present was worked out separately for both the seasons.

Observations on weather parameters

The data on daily weather parameters viz., maximum and minimum temperature, morning and afternoon relative humidity, wind speed, sunshine hours and total rainfall were collected from the Agricultural Research Station, Bidar.

Statistical analysis

The data were subjected to square root transformation to improve the additivity and homoscedasticity of the time-series as per Sokal and Rohlf (1995). The transformed data were analysed by one-way, two-way and three-way ANOVA and means were separated using SAS software. The correlation of weather parameters related to the leafhopper activity was calculated using IBM-SPSS 24.0 software (IBM CROP, 2016).

RESULTS AND DISCUSSION

Leafhopper incidence during 2015-16

The incidence of the leafhopper on Alphanso variety displayed that the lowest populations was observed during the second fortnight of December 2015 (1.16 leaf hopper), the maximum number of pest was observed during second fortnight of January (24.83), first

fortnight of February (33.16), second fortnight of February (34.75) and first fortnight of March 2016 (25.41). In case of Raspuri the lowest population of hoppers were recorded during second fortnight of December 2015 (1.16), the maximum number of hoppers were recorded during first fortnight of April (17.25), second fortnight of February (15.5) and first fortnight of May 2016 (13.16). On Totapuri variety, least hopper population was recorded in first fortnight of December 2015 (0.25 leafhopper) and the maximum number was during first fortnight of April 2016 (15.58). In variety Mulgoa less number of leafhoppers (1) were recorded in second fortnight of December 2015 and highest was recorded (23.33) during first fortnight of April 2016 (Table 1).

In Neelum during second fortnight of December 2015 the leafhopper population was considerable less (0.33 hoppers) and highest was recorded during second fortnight of January to second fortnight of February (~26.5 hoppers) month of 2016. In case of Baneshan variety lowest hopper population was recorded in entire month of December 2015 and sharp highest number of hoppers were recorded during first fortnight of April 2016 (14.91). During second fortnight of December 2015 least population (0.5 hoppers) were recorded, followed by first fortnight of January 2016 (0.75) and highest populations were recorded during complete month of February 2016 (8.5). Likewise on Dasherri variety lowest leafhoppers were recorded in second fortnight of December 2015 (0.91) and more number of hoppers was observed in first fortnight of May 2016 (29.75). In case of Langra, the least hopper population was in second fortnight of December 2015 (1.75 hoppers) and more number of leafhoppers were recorded during first fortnight of April 2016 (17.83). In the same way, the lowest leafhopper population was recorded during second fortnight of December 2015 (0.5) and more number was in the period of first fortnight of April 2016 (19.41 hoppers) (Table 1).

Leafhopper incidence during 2016-17

The incidence of the leafhoppers population was continued in the second fruiting season from first fortnight of December 2016 to second fortnight of May 2017. The leafhopper incidence were recorded in the Alphanso variety showed that the lowest populations was during the first fortnight of December 2016 (1.17 leaf hopper), the highest number of hoppers was recorded during second fortnight of January (25.25), first fortnight of February (32.42), second fortnight of February (35.75) and first fortnight of March 2017 (26.08). Leaf hopper population on Raspuri displayed that the lowest population was during second fortnight of December 2015 (1.42) and the highest number of leafhoppers were observed during first fortnight of April (16.67), first (15.33) and second fortnight of February (15.42) and even on the second fortnight of May 2016 (15.42). The lowest population of leafhoppers on Totapari was recorded during in first fortnight of December 2016 (0.42 leafhopper) and the more during first fortnight of April 2017 (16.75). Similarly, in Mulgoa variety leaf number of leafhoppers (2.67) were recorded during second fortnight of December 2016 and highest number of leafhoppers were observed during first fortnight of April with 25.25 leafhoppers followed by second fortnight of February (20.50 leafhoppers) (Table 2).

In Neelum variety first fortnight of December displayed leaf hopper population (0.33), followed by second fortnight of December 2016 (0.42), highest populations were observed during, first fortnight of January (25.42), first (26.83) and second fortnight of February 2017 (27.33 leafhoppers). In case of Baneshan variety minimum leafhopper population was recorded during entire month of December 2016 (0.50) and highest was recorded during first (16.50) and second fortnight (14.42) of April 2017. The least population of leafhoppers in Mallika variety recorded during first fortnight of January 2017 (0.50), followed by second fortnight of March 2017 and comparatively more numbers was recorded during second

fortnight of February 2017 (8.33 leafhoppers). On Dasher variety lowest count of hopper was recorded during second fortnight of December 2016 (3.92) and more number was observed during first fortnight of April (23.50), followed by second fortnight of February 2017 (18.50). In case of Langra variety the lowest leafhopper populations were recorded during second fortnight of December 2016 (0.83 hoppers) and maximum number of hoppers were recorded during first fortnight of April 2017 (20.17 hoppers). In the same way least number of hoppers were observed during second fortnight of December 2016 (2.17 hoppers) and highest number were recorded during first fortnight of April (21.58) followed by second fortnight of February 2017 of 20.50 hoppers (Table 2).

Leafhopper incidence based on pooled data of 2015-16 and 2016-17

The incidence of the leafhoppers was then pooled to observe the infestation of leafhoppers on the different varieties of the mango during different fortnight of the fruiting season from December 2015 to May 2017. The observation displayed that the incidence of the leafhopper on Alphanso variety was least in first fortnight of December (1.17 leaf hopper), the highest number was recorded number of pest was observed during second (35.25) and first fortnight of February (32.79) followed by first fortnight of March (25.75) and second fortnight of January (25.04). The observation of the Raspuri variety displayed that the lowest population of hoppers were recorded during second fortnight of December (1.29), the highest counts of hoppers was observed during first fortnight of April (16.96), followed by second fortnight of February (15.46) and second fortnight of March with 14.29 hoppers. In Totapuri mango, lowest population was observed in first fortnight of December (0.33 leafhopper) and the highest was in first fortnight of April (16.17). In case of Mulgoa variety 1.83 leafhoppers were observed in second fortnight of December and approximately 15.5 leafhoppers in entire February month. In case of Neelum variety entire month of December the leafhopper

population was considerable less (0.38 hoppers) and maximum during second fortnight of January to second fortnight of February (~26.0 hoppers) month. On the Baneshan variety least hopper population was observed from first fortnight of December to January first fortnight (~0.5) and single peak of pest was observed during first fortnight of April (15.71). In case of Mallika from the beginning of the season the populations were very low but least were observed during first fortnight of January (0.63 hoppers) and maximum was during February month (8.2) of 2016. In Dasher variety least number was observed during second fortnight of December (2.42) and maximum was recorded in the period of April first fortnight (20.79) (Fig. 1).

On Langra variety least hopper population was in second fortnight of December 2015 (1.29 hoppers) and highest peak was in first fortnight of April (19.00). Similarly, in case of least population was in second fortnight of December (1.33) and maximum in first fortnight of April (20.50 hoppers) (Fig. 1). Similarly, many studies were conducted to know the varietal influence on the leaf hopper incidence on mango (Khaire et al., 1997, Hati et al., 2006 & Thangam et al., 2013). The study displayed that the more occurrence of the leafhoppers were observed during flowering-full bloom season compared to offseason. Similarly, in during the flowering season highest leafhoppers population was recorded compared to offseason (Jilani et al., 1991; Viraktamath et al., 1994; Viraktamath et al., 1996; Kudagamage et al., 2001; & Manjunath, 2014).

Effect of weather parameters on Leafhopper incidence

During the first year 2015-16, the congenial weather parameters like temperature and RH played a significant role on hoppers infestation. Except in Alphanso, Neelum and Mallika, the weather parameters like maximum and minimum temperature showed significantly positive correlation for leafhoppers population with 'r' ranged from 0.60 to 0.77 and 0.50 to 0.67 respectively (Table 3). Similarly, a strong positive

correlation observed between the mean hopper populations and temperature (Debnath et al., 2013; & Saeed et al., 2013). In case of many varieties relative humidity (both maximum and minimum) showed negative significant correlation except Neelum, Mallika, Dasher and Landra varieties (Table 3). Likewise, low relative humidity significantly correlated with hopper populations (Joshi & Kumar, 2012).

In second year 2016-17, the favourable temperature and RH were the important factors responsible for increased infestation of leafhoppers. Except Mallika, Neelum and Alphenso, all the other varieties were significantly positive correlation with minimum temperature *i.e* 'r' ranged from 0.52 to 0.70. In contrary, against all variety minimum RH showed significantly negative correlation with $r=-0.57$ to -0.71 . The maximum RH showed significant negative correlation in Totapari ($r=-0.69$), Mulgoa ($r=-0.62$), Baneshan ($r=-0.68$), Dasher ($r=-0.58$) Langra (-0.63) and other variety shows no such relations (Table 4). Similarly, a significant negative correlation was observed with morning and evening relative humidity.

But, the temperature showed significant positive correlation (Debnath et al., 2013). Likewise, temperature had positive and relative humidity negative relation with the activity of leafhoppers (Pezhman, 2005).

Mango varieties ranking based on the incidence of leafhoppers at COH, Bidar

The ranking was done based on the mean infestation of leafhopper from lowest to highest in entire season at COH, Bidar is presented in the Table 5. The varieties like Mallika, Baneshan, Totapari were ranked in I as a Tolerant, followed by Raspuri, Langra, Kesar were grouped under second rank as moderately tolerant and Dasher, Mulgoa, Neelum, Alphanso were considered as the susceptible varieties with ranking of III (Table 5). The work is suggested by Singh and Gyanendra (2007) reported the Mallika variety is the leaf affected by leafhoppers and considered as a tolerant genotype. Similarly the varieties like Baneshan, Khadar, Neelgoa, Rumani as was considered as tolerant and Neelum and Neeleshan as a susceptible based on the infestation level of hoppers (Viraktamath et al., 1996).

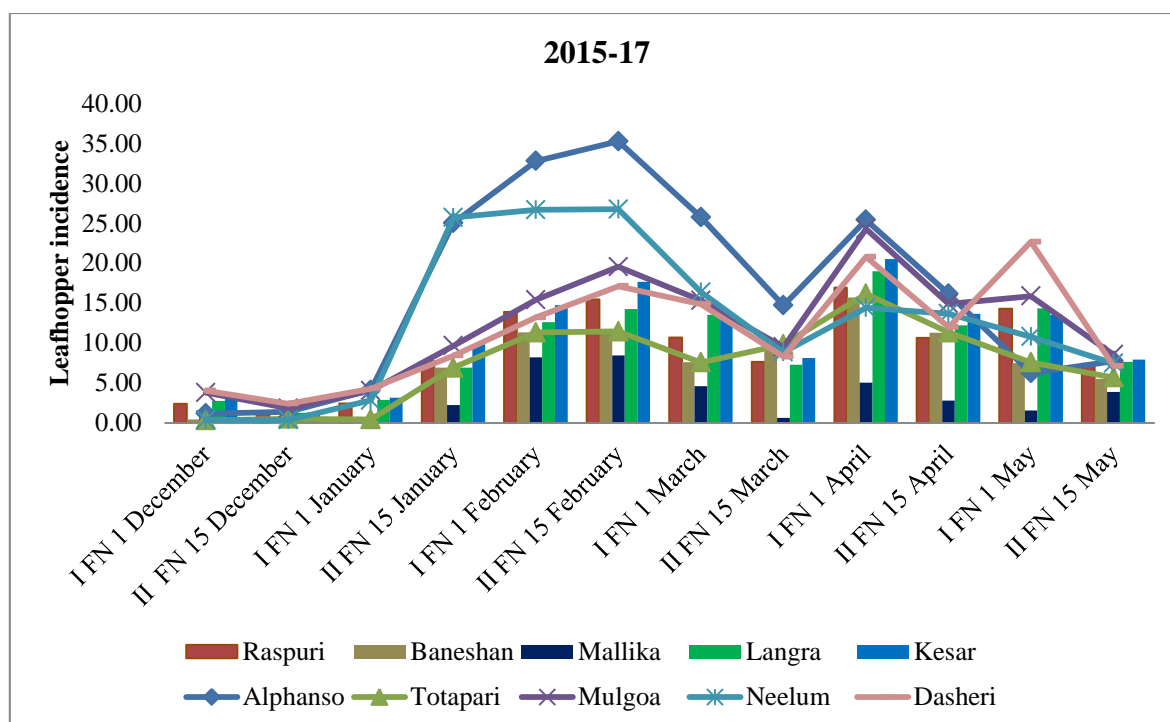


Figure 1. Pooled Leaf hoppers incidence on the different mango varieties during 2015-17

Table 1: Incidence of the mango leafhoppers on the different varieties of the mango cultivars during 2015-2016

Date of Observation	Alphonso	Raspuri	Totapari	Mulgoa	Neelum	Baneshan	Mallika	Dasheri	Langra	Kesar
I FN 1 Dec 15	1.16 (1.078)	1.75 (1.32)	0.25 (0.40)	2.83 (1.68)	0.41 (0.63)	0.41 (0.63)	1.25 (1.11)	2.91 (1.70)	2.33 (1.52)	2.91 (1.70)
II FN 15 Dec 15	1.41 (1.189)	1.16 (1.07)	0.5 (0.70)	1 (1)	0.33 (0.45)	0.41 (0.63)	0.5 (0.70)	0.91 (0.95)	1.75 (1.26)	0.5 (0.69)
IFN 1 Jan 16	4 (1.99)	1.58 (1.24)	0.41 (0.63)	3.25 (1.80)	2.83 (1.68)	0.5 (0.69)	0.75 (0.86)	3.16 (1.77)	2.75 (1.65)	2.75 (1.65)
II FN 15 Jan 16	24.83 (4.98)	7.58 (2.75)	6.41 (2.52)	8.75 (2.95)	26 (5.09)	6.75 (2.59)	2.08 (1.43)	7 (2.64)	5 (2.23)	7.58 (2.74)
I FN 1 Feb 16	33.16 (5.75)	12.5 (3.53)	10.08 (3.17)	14.58 (3.81)	26.5 (5.14)	10.08 (3.16)	8.5 (2.91)	13.91 (3.73)	12.75 (3.5)	14.58 (3.81)
II FN 15 Feb 16	34.75 (5.89)	15.5 (3.93)	12 (3.46)	18.58 (4.31)	26.16 (5.11)	12.41 (3.52)	8.58 (2.92)	15.75 (3.96)	13.5 (3.67)	14.83 (3.85)
I FN 1 Mar 16	25.41 (5.04)	12.25 (3.49)	7 (2.64)	15 (3.87)	16.33 (4.04)	7.16 (2.67)	3.83 (1.95)	15.25 (3.90)	13.25 (3.63)	12.66 (3.55)
II FN 15 Mar 16	13.83 (3.71)	7.5 (2.73)	9.08 (3.01)	8.33 (2.88)	8.66 (2.94)	9.58 (3.09)	0.66 (0.81)	7.33 (2.70)	6.83 (2.61)	8.66 (2.93)
I FN 1 Apr 16	25.5 (5.04)	17.25 (4.15)	15.58 (3.94)	23.33 (4.83)	12.83 (3.58)	14.91 (3.85)	5.08 (2.25)	18.08 (4.25)	17.83 (4.21)	19.41 (4.40)
II FN 15 Apr 16	24.83 (4.98)	11 (3.31)	8.66 (2.94)	13.91 (3.72)	13.08 (3.61)	8.16 (2.85)	2.41 (1.55)	12.08 (3.47)	12.16 (3.48)	15.83 (3.95)
I FN 1 May 16	5.75 (2.39)	13.16 (3.62)	7.16 (2.67)	15.25 (3.90)	10.83 (3.29)	6.5 (2.54)	1.33 (1.15)	29.75 (5.18)	14 (3.74)	14.16 (3.76)
II FN 15 May 16	7.91 (2.81)	7.25 (2.68)	5.91 (2.43)	7.583 (2.75)	7.41 (2.72)	5.83 (2.41)	3.75 (1.93)	6.75 (2.59)	7.41 (2.72)	7.83 (2.79)
Mean	16.88 (3.74)	9.04 (2.82)	6.92 (2.38)	11.03 (3.12)	12.61 (3.19)	6.89 (2.39)	3.22 (1.63)	11.07 (3.07)	9.13 (2.86)	10.14 (2.99)
S.EM=	0.03	0.07	0.081	0.027	0.08	0.09	0.05	0.35	0.09	0.10
SE.d=	0.05	0.1	0.11	0.038	0.11	0.13	0.07	0.49	0.13	0.14
CD(5%)=	0.10	0.20	0.23	0.080	0.23	0.28	0.14	1.02	0.28	0.29

Table 2: Incidence of the mango leafhoppers on the different varieties of the mango cultivars during 2016-17

Date of Observation	Alphonso	Raspuri	Totapari	Mulgoa	Neelum	Baneshan	Mallika	Dasheri	Langra	Kesar
I FN 1 Dec 16	1.17 (1.08)	3.08 (1.75)	0.42 (0.64)	4.75 (2.18)	0.33 (0.57)	0.50 (0.69)	1.33 (1.15)	5.17 (2.26)	3.17 (1.78)	4.58 (2.13)
II FN 15 Dec 16	1.42 (1.19)	1.42 (1.19)	0.58 (0.76)	2.67 (1.63)	0.42 (0.52)	0.50 (0.69)	1.00 (0.99)	3.92 (1.98)	0.83 (0.91)	2.17 (1.47)
I FN 1 Jan 17	4.25 (2.06)	3.33 (1.82)	0.50 (0.69)	4.83 (2.20)	2.83 (1.68)	0.58 (0.62)	0.50 (0.71)	5.42 (2.32)	3.00 (1.73)	3.58 (1.89)
II FN 15 Jan 17	25.25 (5.02)	7.92 (2.81)	7.42 (2.72)	10.58 (3.25)	25.42 (5.04)	7.08 (2.66)	2.42 (1.55)	9.83 (3.13)	8.83 (2.97)	12.17 (3.49)
I FN 1 Feb 17	32.42 (5.69)	15.33 (3.92)	12.58 (3.55)	16.25 (4.03)	26.83 (5.18)	12.58 (3.55)	7.92 (2.81)	12.50 (3.54)	12.47 (3.53)	14.92 (3.86)
II FN 15 Feb 17	35.75 (5.98)	15.42 (3.92)	10.92 (3.30)	20.50 (4.53)	27.33 (5.23)	11.17 (3.34)	8.33 (2.89)	18.50 (4.30)	15.03 (3.87)	20.50 (4.53)
I FN 1 Mar 17	26.08 (5.11)	9.17 (3.01)	8.17 (2.86)	15.67 (3.96)	16.42 (4.05)	8.08 (2.84)	5.42 (2.32)	14.50 (3.81)	13.83 (3.72)	14.25 (3.77)
II FN 15 Mar 17	15.58 (3.95)	7.83 (2.80)	10.58 (3.24)	10.67 (3.27)	9.08 (3.01)	9.50 (3.08)	0.58 (0.76)	9.25 (3.04)	7.75 (2.78)	7.58 (2.75)
I FN 1 Apr 17	25.33 (5.03)	16.67 (4.08)	16.75 (4.09)	25.25 (5.02)	16.00 (4.00)	16.50 (4.06)	5.00 (2.24)	23.50 (4.85)	20.17 (4.49)	21.58 (4.65)
II FN 15 Apr 17	7.50 (2.74)	10.33 (3.21)	14.00 (3.71)	15.92 (3.99)	14.25 (3.77)	14.42 (3.76)	3.17 (1.77)	11.92 (3.45)	12.25 (3.50)	11.50 (3.39)
II FN 1 May 17	6.75 (2.60)	15.42 (3.92)	8.00 (2.83)	16.50 (4.06)	10.75 (3.28)	8.50 (2.91)	1.83 (1.35)	15.58 (3.95)	14.67 (3.83)	12.92 (3.59)
II FN 15 May 17	7.58 (2.75)	7.58 (2.75)	5.50 (2.34)	9.50 (3.08)	7.50 (2.74)	5.25 (2.28)	4.00 (2.00)	7.50 (2.73)	7.92 (2.81)	8.00 (2.83)
Mean	15.76 (3.60)	9.46 (2.93)	7.95 (2.56)	12.76 (3.43)	13.10 (3.26)	7.89 (2.54)	3.46 (1.71)	11.47 (3.28)	9.99 (3.16)	11.15 (3.20)
S.EM=	0.04	0.10	0.12	0.03	0.10	0.16	0.06	0.12	0.06	0.07
SE.d=	0.06	0.14	0.16	0.04	0.14	0.23	0.08	0.16	0.08	0.10
CD(5%)=	0.12	0.29	0.34	0.08	0.29	0.48	0.17	0.34	0.17	0.22

Table 3: Correlation between leafhoppers and abiotic factors on different varieties of mango in 2015-16

Weather Parameters	Alphonso	Raspuri	Totapari	Mulgoa	Neelum	Baneshan	Mallika	Dasheri	Langra	Kesar
Rainfall	-0.25	0.29	0.04	0.24	-0.07	0.00	-0.20	0.74*	0.35	0.26
Min Temp	0.40	0.72*	0.71*	0.70*	0.22	0.69*	0.33	0.60*	0.76*	0.77*
Max Temp	0.24	0.60*	0.61*	0.57	0.06	0.58	0.16	0.50	0.64*	0.65*
Max RH	-0.53	-0.51	-0.66*	-0.48	-0.35	-0.65*	-0.19	-0.27	-0.49	-0.61*
Min RH	-0.53	-0.44	-0.57*	-0.40	-0.36	-0.58*	-0.30	-0.18	-0.42	-0.50
Wind speed	-0.34	-0.12	-0.14	-0.17	-0.23	-0.15	-0.02	-0.06	-0.10	-0.15

Table 4: Correlation between leafhoppers and abiotic factors on different varieties of mango in 2016-17

Weather Parameters	Alphanso	Raspuri	Totapari	Mulgoa	Neelum	Baneshan	Mallika	Dasherri	Langra	Kesar
Rainfall	-0.04	0.23	0.17	0.28	0.05	0.21	0.05	0.27	0.38	0.18
Min Temp	0.16	0.62*	0.68*	0.67*	0.19	0.68*	0.29	0.62*	0.70*	0.52*
Max Temp	-0.08	0.44	0.50	0.46	0.00	0.50	0.05	0.40	0.52	0.29
Max RH	-0.14	-0.47	-0.69*	-0.62*	-0.09	-0.68*	-0.16	-0.58*	-0.63*	-0.45
Min RH	-0.71*	-0.57*	-0.78*	-0.67*	-0.61*	-0.76*	-0.50*	-0.63*	-0.60*	-0.65*
Wind speed	-0.24	0.14	0.07	0.10	-0.12	0.08	0.04	0.04	0.18	0.02

Table 5: Ranking of mango varieties based on the mean incidence of total mango leafhoppers at COH, Bidar

Varieties	Mean leafhopper incidence recorded	Rank	Incidence level	Remarks
Mallika	3.34	I	0-8 leafhopper	Tolerant
Baneshan	7.39			
Totapari	7.43			
Raspuri	9.25	II	8-11 leafhopper	Moderately tolerant
Langra	9.56			
Kesar	10.64			
Dasherri	11.27	III	>11 leafhopper	Susceptible
Mulgoa	11.89			
Neelum	12.85			
Alphanso	16.32			

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