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LOSS ASSESSMENT BY RELEASING HOPPERS ON YOUNG SHOOTS AND FLOWERING AND FRUITED PANICLES OF MANGO

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ABSTRACT : Loss assessment study by hopper on shoots showed that per cent leaf infestation per shoot increased significantly with the increase in hopper population. Maximum infestation (91.47%) occurred on shoots having 20 hoppers per shoot, whereas those with 10 and 15 hoppers per shoot suffered more or less 50 per cent infestation. Number of hopper eggs per leaf also varied significantly with the increase in hopper population. Maximum eggs (15.40 per leaf) were recorded on leaves where 20 hoppers per shoot were released. Per cent increase in shoot length was also affected significantly with the increase in hopper population. It was minimum (4.88) where 20 hoppers per shoot were released. However, the shoots with 0 and 5 as well as 10 and 15 hoppers per panicle were also at par. Per cent reduction in fruit set was maximum (95) on panicles where 20 hoppers per panicle were released. However no significant differences were observed on panicles where hoper populations were 10, 15 and 20. Per cent fruit drop was maximum (81.25) where, 30, 35 and 40 hoppers per panicle were released and minimum (8.81) where no hopper was released. Percent reduction in fruits weight per panicle was maximum (84.58) where 40 hoppers per panicle were released and minimum (14.60%) with 5 hoppers per panicle.

Keywords : *Loss assessment, mango hopper, shoots, panicles, fruits.*

The mango (*Mangifera indica* Linn.) is the most important tropical/subtropical fruit in the world. Over the period of time insect pests have been the key factors in healthy mango production, in terms of quality as well as quantity (Dwivedi *et al.,* 3; Rahman and Kuldeep, 5; Rahman *et al.,* 8). Mango leaf hopper, mango mealy bug, bark eating caterpillar, mango fruit fly and mango shoot gall psylla are reported to cause serious damage to mango crop but mango leaf hopper is the major one and now, in changing climate scenario it is becoming a major threat to mango production (Rahman *et al.,* 9; Rahman *et al.,* 6; Rahman *et al.,* 7). Singh and Mandal (11) have found reduction in fruit setting and premature fruit drops due to this insect pest. Nayyar *et al.* (4) and Sathiyanandum *et al.* (10) noticed that flowers and buds wither due to the hopper attack and even wilting and dropping in serious cases. Besides the sucking of sap by the nymphs and adults also cause withering and shedding of flowers. Losses due to hopper vary from 25 to 60 per cent

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MATERIALS AND METHODS

Young shoots

The field experiments were conducted at the Horticultural Research Centre, Patharchatta, GBPUA&T, Pantnagar (U.S. Nagar), Uttarakhand on the young shoots of cv. Dashehari having five treatments with five replications each. For each treatment, five young shoots were selected and caged with nylon bags of cylindrical shape sleeved at both ends each of which had a length of about 45 cm and diameter of 30 cm. Bagging was done in first week of June when new leaves had emerged. Hoppers were released on selected shoots when these attained a length of 11.43 cm. The treatments *i.e.* number of hopper released per panicle were 5,10,15 and 20, whereas in control no hopper was released. Observations were taken on the number of surviving hoppers and more hoppers were released if needed to maintain the initial population. Final observation was taken on July 27, after 45 days from the date of hopper release. Data were recorded for per cent leaf infestation, number of eggs per leaf (equal to cracking on the leaf) and per cent increase in shoot length.

Table 1: Loss assessment by releasing hoppers on young shoots, flowering panicles and fruited panicles.

Treatments (Hopper population/ shoot)	Leaves infested (%)	Hopper eggs/leaf	% Shoot length increase	Per cent reduction in fruit set/panicle
0 (Control)	0.00 (0.00^{e})	0.00^{a}	22.83 (15.06^{a})	
5	20.27 (26.68^{a})	1.05^{a}	13.31(21.34^{ab})	51.66 (45.89^{a})
10	47.57 (43.59^{b})	3.75^{b}	10.67 (18.78^{b})	83.33 (73.94^{b})
15	58.15 (49.82^{c})	10.15^{c}	9.32 (17.45^{b})	95.00 (83.99^{b})
20	91.47 (73.20^{d})	15.40^{d}	4.88 (12.56^{c})	95.00 (83.99^{b})
CD(P=0.05)	5.55	1.58	3.82	15.90
CV	10.72	19.42	15.33	18.60

**Data given in parentheses indicate the transformed value*
—Means followed by same latter are not significantly different

Table 2: Per cent fruit drop per panicle and percent reduction in fruit weight over control in loss assessment study.

Treatments (Hoppers/panicle)	Fruit drop/panicle (%)	% Fruit weight reduction/ panicle
0 (Control)	8.81 (8.81^{a})	—
5	29.16 (28.88^{ad})	14.60 (22.40^{a})
10	37.08 (33.62^{bd})	27.08 (30.73^{a})
15	46.66 (39.06^{bd})	30.83 (29.87^{a})
20	62.50 (56.24^{bc})	42.08 (39.38^{ac})
25	62.50 (56.24^{bc})	60.41(55.04^{bc})
30	81.25 (61.44^{c})	65.00(57.75^{bc})
35	81.25 (71.24^{c})	77.50(68.94^{b})
40	81.25 (71.24^{c})	84.58(73.30^{b})
CD (P = 0.05)	24.55	19.55
CV	33.68	28.18

**Data given in parentheses indicate the transformed value*
-Means followed by same latter are not significantly different.

Flowering panicles

The experiment was conducted on mango panicles cv. Dashehari during first week of March when the panicle attained a length of more than 10 cm. The experiment consisted of six treatments with five replications each. Five panicles for each treatment were selected and caged with nylon bags of cylindrical shape sleeved at both ends each of which had a length of 45 cm and diameter of 30 cm. Release of 2nd instar nymphs of the hoppers was done on March 4, Weekly observations were taken for the survival of hoppers and more hoppers were released to maintain the initial population. The treatments *i.e.* number of hopper released per panicle were 2,5,10,15 and 20 whereas in control no hopper was released. Ten *coccinellids* per panicle were also released in each bag to help in pollination process. Final observations were taken after 40 days i.e. on April 15,. Data were recorded for the number of fruit set per panicle and then per cent reduction in fruit set as compared to control was calculated.

Fruited panicles

The experiment was conducted when the fruits attained the marble size during third week of April. The experiment consisted of eight treatments with four replications each. The panicles each of which bearing not less than three fruits were caged with nylon bag of cylindrical shape sleeved at both ends. Release of hoppers was done on April 20. The treatments *i.e.* number of hopper released/ panicle were 5, 10, 15, 20, 25, 30, 35 and 40 whereas in control no hopper was released. Weekly observations were taken for the survival of the hoppers and more hoppers were released time to time to maintain the initial population. Final observations were taken on July 6, when fruits were harvested. The observations were taken as the number of fruits/panicle and weight of fruits per panicle. After that, per cent fruit drop and percent reduction in fruit weight as compared to control were estimated.

RESULTS AND DISCUSSION

Data presented in Table 1 showed that per cent leaf infestation increased significantly with the increase in hopper population. The infestation was 20.27 per cent where 5 hoppers per shoot were released followed by 47.57 and 58.15 per cent with 10 and 15 hoppers per shoot. Maximum infestation (93.47%) was recorded where 20 hoppers per shoot were released whereas in control where no hopper was released, no infestation occurred. Number of hopper eggs per leaf was 1.05 with 5 hoppers per shoot that was at par with

the control (Table 1). Number of eggs per leaf increased to 3.75 where 10 hoppers per shoot was released followed by 10.15 and 15.40 eggs per leaf with 15 and 20 hoppers per shoot, respectively which were significantly different from each other as well as control.

Maximum shoot length increase (22.83 per cent) was observed in control followed by 13.31 per cent with 5 hoppers per shoot, which were at par (Table 1). Per cent shoot length increase were 10.67 and 9.32 where 10 and 15 hoppers per shoot were released which were at par, but significantly different from control. Minimum shoot length increase (4.88 per cent) occurred where 20 hoppers per shoot were present which was significantly different from other treatments. Lowest reduction in fruit set per panicle (31.66%) was recorded when 2 hoppers per panicle were released, whereas, 5 hoppers per panicle caused 51.66 per cent reduction, which were at par (Table 1). Reduction in fruit set was 83.33 per cent per panicle when 10 hoppers were released, whereas maximum reduction (95%) was shown by panicles with 15 and 20 hoppers per panicle, which were at par.

Fruit drop was lowest (8.81%) in control with no hopper, whereas 29.16 per cent fruit drop occurred where 5 hoppers per panicle were released which were at par (Table 2). Fruit drops were 37.08, 46.66 and 62.50 per cent, which were at par when 10, 15 and 20 hoppers per panicle were released, respectively. The panicles with 25 hoppers per panicle also shown 62.50 per cent fruit drop. Maximum fruit drop per panicle (81.25%) occurred when 30, 35 and 40 hoppers were released. It is also clear from Table 2 that reductions in fruit weight per panicle were 14.60, 27.08 and 30.83 per cent when 5, 10 and 15 hoppers per panicle were released. There were 42.08, 60.41 and 65.00 per cent reduction in fruit weight occurred where the hopper population were 20, 25 and 30 per panicle. The panicles with 35 hoppers per panicle suffered 77.50 per cent reduction, whereas maximum reduction (84.58) in fruit weight was recorded with 40 hoppers per panicle. Chari *et al.* (2) and Bindra *et al.* (1) have also found reduction in fruit setting and premature fruit drop due to these insects. Verghese and Rao (12) determined the relevant critical stages for the management of *I. clypealis* and reported that 2 adults per panicle at post blossom stage were sufficient to cause yield reduction.

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