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# Population dynamics of fruit borer, *Deudorix Isocrates* of aonla fabr. (Lycaenidae: Lepidoptera) in relation to abiotic factors

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**Abstract**
Study on ' Population dynamics of major insect pests like borers of aonla in relation to abiotic factors was conducted at two locations *i.e*., Dryland Research Station (DRS), Dhiansar, and RHRSS, Raya *i.e*., of Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu for two consecutive year during. 2016 and 2017. The peak larval population of fruit borer was observed in 36th SW at DRS and 35th SW at RHRSS, Raya *viz*., 19.75 and 25.75, respectively during 2016. Similarly, fruit borer population dynamics were also observed during 36th and 35th SW during 2017 at DRS, Dhiansar (19.75) and RHRSS, Raya (26.07) locations. The only factor relative humidity (morning) at RHRSS, Raya was found to be positively (0.458*) and significant for increasing the fruit borer population during 2016. While during 2017, maximum temperature had the highly negative significant correlation and relative humidity (morning) and relative humidity (evening) were found to be highly positive significant impact on population build up of fruit borer on both the locations on aonla.

**Keywords:** Aonla, population dynamics and fruit borer

## 1. Introduction
*Aonla (Emblica officinalis Gaertn syn. Phyllanthus emblica L*.), the king of arid fruits also known as Indian gooseberry, is one of the traditional fruits to India belongs to family Euphorbiaceae. It is indigenous to India and has great medicinal and nutritional value which is gaining popularity among farmers and consumers having immense potential of cultivation in arid and wastelands [1]. Though, considered to be a hardy fruit crop, not less than 30 insect and mite species have been recorded feeding on this scared tree from different places, mostly from India [2]. The major constraint in aonla fruit production is ravages caused by the insects, disease and some physiological problems throughout the world. Among the insect pests, the aonla shoot gall maker (*Betousa stylophora*), leaf rolling caterpillar (*Gacillaria acidula*), bark *eating caterpillar (Inderbela quardinatata), fruit borer (Dueodorix isocrates),* fruit moths (*Otheris fullonica, O. materna*) and mealy bug have been reported to be of major importance [3, 4, 5]. In 2007 [6], have highlighted the first record of anar fruit borer, Deudorix isocrates Fabricius infesting aonla trees in Jammu region and causing considerable losses during fruiting periods. keep a continuous vigil on pest fauna of this crop so as to build an effective pest management strategy for this fruit crop. The present study is thus proposed to investigate the pest infestation in aonla and to evaluate the available cultivars of aonla for their reaction to important pests. Since the incidence and development of all the insect pests are very much dependent upon the prevailing weather conditions, such as temperature, relative humidity, and precipitation [7], it is therefore imperative to generate a baseline data and to fill the existing information gaps.

## 2. Materials and Methods
The present study was conducted at RHRSS, Raya and Dryland Research Station, Dhiansar, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu. The details of materials used, experimental procedures followed and techniques adopted for the present investigations on population dynamics of aonla fruit borer in relation to abiotic factors. Observations was recorded for fruit borer dynamics, twenty fruits were randomly selected from each of the five trees in all geographical directions for recording fruit infestation. All the agronomic practices recommended by Sher-e-Kashmir University of Agricultural Sciences and

Technology of Jammu for raising the crop was followed. Weekly records of borers were made on the 5 randomly selected tagged plants. The observations were recorded when the borers appeared in the field. Weekly data on temperature (maximum / minimum °C), relative humidity (morning and evening percent), and rainfall (mm) was obtained from the Agro meteorological section, Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu. These data were subjected to correlation analysis with various abiotic factors of the environment and the statistical analysis was worked out. To determine the role of abiotic factors on the borers, data obtained during the cropping season was analyzed through correlation and regression analysis. Simple correlations were calculated in order to find possible relationship of borers with various meteorological factors. Borers population individually represented as dependent variables by $Y_1$ and $Y_2$ and abiotic factors as the independent variables like temperature (maximum), temperature (minimum), mean relative humidity (morning & evening) and rainfall were represented by $X_1$, $X_2$, $X_3$, $X_4$ and $X_5$. The data were analyzed with the help of a statistical package SPSS-16.0 version. Adequacy of best fitted regression equations were judged with the help of coefficient of multiple determinations ($R^2$).

The effect of various environmental factors under study on population of borers were estimated by using multiple linear regression analyses with the prediction equations given as:

Est. $Y_2 = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5$

Where, $Y_2$ represent borers population on aonla, 'a' is the constant (intercept) and $b_1$ to $b_5$ are the estimated regression coefficient associated with $X_1$ to $X_5$, respectively. For this, field experiment was laid out during 2016 and 2017 with 07 different aonla cultivars such as NA-6 (Narendra Aonla-6), NA-10 (Narendra Aonla-10), NA-7 (Narendra Aonla-7), Chakaiya, Banarasi, Local Deshi and Francis for their response against against borers. Observations on pest incidence were recorded in terms of percent leaf and fruit at weekly interval. In every observation, 4 plants were selected randomly and tagged. In case of fruit infestation by fruit borer, observations were made at each picking. Total number of healthy and infested fruits were counted and also weighed separately. Hence, infestation (%) both on number and weight basis was worked out. Rests of agronomical practices were followed as per package of practices of SKUAST, Jammu. No plant protection measures were given for recording the varietal screening.

**2.1 Varieties observed:**

1. NA-6 (Narendra Aonla-6),
2. NA-10 (Narendra Aonla-10),
3. NA-7 (Narendra Aonla-7),
4. Chakaiya,
5. Banarasi,
6. Local Deshi, and
7. Francis

Number of plants per variety: 4

Percent incidence was calculated as per the following formula:

$$\text{Incidence (\%)} = \frac{\text{No. of fruits infested}}{\text{No. of fruits examined}} \times 100$$

Scales for determining the resistance reaction against fruit borer damage is as follows-

| Grade | % fruit damage | Resistance reaction |
|---|---|---|
| 0 | No damage | Immune |
| 1 | 0 - 5.0 | Resistant (R) |
| 2 | 5.1 – 10.0 | Moderately Resistant (MR) |
| 3 | 10.1– 15.0 | Moderately Susceptible (MS) |
| 4 | 15.1– 20.0 | Susceptible (S) |
| 5 | >20.0 | Highly Susceptible (HS) |

The data was analyzed by using SPSS-16 package.

## 3. Results

In terms of economy, the fruit borer, *Deudorix isocrates* was found to be the most damaging insect pest for aonla fruits. The pest appeared for a very little shorter span of time i.e., from July (22nd SW) up to (41st or 45th SW) but the damage caused by this pest was found to be economical. The peak larval population was observed in 36th SW at DRS and 35th SW at RHRSS, Raya viz., 19.75 and 25.75, respectively during 2016.Similar trend of fruit borer population dynamics were also observed during 36th and 35th SW during 2017 at DRS, Dhiansar (19.75) and RHRSS, Raya (26.07) locations. The trend in seasonal population fluactuations of fruit borer insect at Dhiansar and Raya were observed to be more or less similar with slight fluctuations/variation in population due to aberrated pattern in weather conditions. Impact of weather factors indicated that relative humidity (morning and evening) and temperature (maximum and minimum) had the significant correlation on the fruit borer population dynamics. The only factor relative humidity (morning) at RHRSS, Raya was found to be positively (0.458*) and significant for increasing the fruit borer population during 2016. While during 2017, Maximum temperature had the highly negative significant correlation and relative humidity (Morning) and relative humidity (Evening) were found to be highly positive significant impact on population build up of fruit borer on both the locations on The overall impact of weather parameters in regulating the population was found to be 30.90 and 42.60 and 57.30 and 59.80 at DRS, Dhiansar and RHRSS, Raya, respectively.

**Table 1:** Population dynamics of fruit borer at different locations on aonla fruits of Jammu during 2016

| St. Weeks | Time of the month and year | Locations | | Weather parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | | DRS, Dhiansar | RHRSS, Raya | Max. Temp. | Min. Temp. | RH Morn | RH Even | Rain fall |
| 22 | 28-3 Jun | 0.25 | 0.5 | 39.3 | 22.1 | 51 | 30 | 0 |
| 23 | 4-10 | 0.5 | 1.5 | 40.4 | 24.0 | 46 | 27 | 6.4 |
| 24 | 11-17 | 0.75 | 2.75 | 38.5 | 26.6 | 61 | 42 | 21.6 |
| 25 | 18-24 | 1 | 3 | 36.1 | 25.1 | 73 | 52 | 42.8 |
| 26. | 25-1 July | 2.5 | 4.5 | 37.2 | 28.1 | 68 | 54 | 19 |
| 27. | 2-8 | 3 | 5.25 | 34.6 | 25.2 | 80 | 64 | 16.6 |
| 28. | 9-15 | 3.5 | 5.75 | 34.7 | 25.8 | 79 | 60 | 69.4 |
| 29. | 16-22 | 4.5 | 6.75 | 34.1 | 24.9 | 81 | 62 | 19.8 |
| 30. | 23-29 | 5.75 | 8.5 | 32.8 | 23.9 | 86 | 73 | 192.6 |
| 31. | 30-5 Aug | 7.5 | 10.5 | 34.0 | 25.2 | 83 | 65 | 165.2 |
| 32. | 6-12 | 10.75 | 15.25 | 30.6 | 24.6 | 87 | 77 | 193.3 |
| 33. | 13-19 | 12.25 | 16.75 | 35.2 | 25.0 | 80 | 58 | 18.8 |
| 34. | 20-26 | 14.00 | 23.25 | 33.5 | 25.4 | 81 | 64 | 5.4 |
| 35. | 27-2 Sep | 16.25 | 25.75 | 33.2 | 23.6 | 82 | 61 | 77.4 |
| 36. | 3-9 | 19.75 | 16.75 | 35.0 | 24.4 | 72 | 56 | 3 |
| 37. | 10-16 | 11.5 | 12.75 | 33.9 | 23.4 | 80 | 54 | 23.2 |
| 38. | 17-23 | 5.5 | 6.75 | 34.1 | 24.6 | 75 | 60 | 21.5 |
| 39. | 24-30 | 2.25 | 2.75 | 32.9 | 23.9 | 85 | 65 | 13.4 |
| 40. | 1-7 Oct | 1.75 | 0.75 | 34.2 | 23.5 | 79 | 63 | 1.2 |
| 41. | 8-14 | 0.25 | 0.25 | 32.7 | 18.0 | 75 | 57 | 0 |

**Table 2:** Population dynamics of fruit borer at different locations on aonla fruits of Jammu during 2017

| St. Weeks | Time of the month and year | Locations | | Weather parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | | DRS, Dhiansar | RHRSS, Raya | Max. Temp. | Min. Temp. | RH Morn | RH Even | Rain fall |
| 22 | 28-3 Jun | 0.46 | 0.61 | 37.6 | 22 | 58 | 32 | 7.6 |
| 23 | 4-10 | 0.93 | 1.79 | 39.9 | 23.9 | 65 | 29 | 18.6 |
| 24 | 11-17 | 1.08 | 3.05 | 37.2 | 22.9 | 59 | 31 | 2.6 |
| 25 | 18-24 | 1.98 | 3.34 | 33.6 | 23.2 | 80 | 61 | 68 |
| 26. | 25-1 July | 3.54 | 4.96 | 34 | 25.8 | 77 | 62 | 147.2 |
| 27. | 2-8 | 4.10 | 6.75 | 36.3 | 24.8 | 78 | 57 | 13 |
| 28. | 9-15 | 4.45 | 7.39 | 34.5 | 25.5 | 83 | 67 | 33.2 |
| 29. | 16-22 | 6.90 | 8.13 | 33.9 | 24.9 | 82 | 66 | 71.4 |
| 30. | 23-29 | 7.78 | 8.58 | 34.2 | 25 | 86 | 64 | 137.8 |
| 31. | 30-5 Aug | 9.15 | 12.11 | 32.1 | 25.6 | 91 | 78 | 110.6 |
| 32. | 6-12 | 11.85 | 15.80 | 34.5 | 24.9 | 90 | 67 | 57.4 |
| 33. | 13-19 | 14.05 | 17.59 | 34.4 | 26.1 | 85 | 61 | 14 |
| 34. | 20-26 | 16.59 | 24.99 | 33.3 | 23.8 | 84 | 62 | 21.4 |
| 35. | 27-2 Sep | 18.32 | 26.07 | 31.6 | 23.8 | 89 | 70 | 50 |
| 36. | 3-9 | 19.75 | 17.56 | 33.5 | 23.4 | 87 | 61 | 1.5 |
| 37. | 10-16 | 9.11 | 12.95 | 34.3 | 22.5 | 84 | 52 | 0 |
| 38. | 17-23 | 6.67 | 7.45 | 34.8 | 21.6 | 80 | 48 | 0 |
| 39. | 24-30 | 2.32 | 3.76 | 34.4 | 23.3 | 86 | 52 | 0 |
| 40. | 1-7 Oct | 0.65 | 1.71 | 34.4 | 20.6 | 87 | 46 | 0 |
| 41. | 8-14 | 0.28 | 1.05 | 34.1 | 18.2 | 82 | 43 | 0 |

## 4. Discussion

The present result is also well supported by the experiments conducted by [6], who observed that the larvae of anar fruit borer infestation was first time noticed on aonla fruits after the mid July (29th SW) and causing damage up to the extent of 26.25 to 35.00 percent. They also observed that the percent fruit damage was recorded highest at mid height i.e., on mid canopy (at 8-9 feet) rather than at lower and upper canopy of the aonla tree. Further, similar lines to the results obtained by [10, 8] who recorded fruit borer as the main pest of aonla and [1] recorded pomegranate fruit borer, *Deudorix isocrates* (Fab.) (Lepidoptera: Lycaenidae), as one of the most destructive pests, high incidence during August to September and causing huge losses on pomegranate.

## 5. Conclusion

The fruit borer appeared for a very shorter span of time i.e., from July (22nd SW) up to (41st or 45th SW) but the damage caused by this pest was found to be enormous. The peak larval population was observed in 36th SW at DRS and 35th SW at RHRSS, Raya viz., 19.75 and 25.75, respectively during 2016. Similarly, fruit borer population dynamics were also observed during 36th and 35th SW during 2017 at DRS, Dhiansar (19.75) and RHRSS, Raya (26.07) locations. The only factor relative humidity (morning) at RHRSS, Raya was found to be positively (0.458*) and significant for increasing the fruit borer population during 2016. While during 2017, Maximum temperature had the highly negative significant correlation and relative humidity (Morning) and relative humidity (Evening) were found to be highly positive significant impact on population build up of fruit borer on

both the locations on aonla. The overall impact of weather parameters in regulating the population was found to be 30.90 and 42.60 and 57.30 and 59.80 at DRS, Dhiansar and RHRSS, Raya, respectively.

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**7. References**

1. Hiwale S. Aonla (Indian gooseberry). In: Sustainable Horticulture in Semiarid Dry Lands, (Hiwale, S. Ed.) Springer, India, 2015.
2. Lakra RK. Some important pests of fruit crops of arid regions and their management. Proc. Natln. Symp. Arid Horticulture, Horticulture Society of Haryana, CCSHAU, Hisar, 1996, 144-147.
3. Chadha KL. Handbook of Horticulture, ICAR Publication, New Delhi, 2003, 747.
4. FAO. Proceedings of Promotion of Medicinal and Aromatic Plants in the Asia-Pacific Region, Bangkok, Thailand, 2-3 December, Paroda R, Dasgupta S, Mal B, Ghosh SP. Pareek SK. (eds.) 2013, 282.
5. Satyagopal K. AESA based IPM package for Amla. 2014, 32.
6. Shankar U, Kaul V, Rai S. New record of anar fruit borer, *Deudorix isocrates* (Fabricius) on aonla (*Emblica officinalis*) in Jammu. Journal of Research, SKUAST-J, 2007; 6(2):291-294.
7. Aheer GM, Ahmed KJ, Ali A. Role of weather in fluctuating aphid density in wheat crop. J Agric. Res. 1994; 32:295-301.
8. Haseeb M, Abbas SR, Srivastava RP, Sharma S. Studies on insect pests of aonla (*Emblica officinalis* Linn.*)*. Annals of Plant Protection Sciences. 2000; 8(1):85-88.
9. Kumar KP. Bio-ecology and management of pomegranate fruit borer, *Deudorix isocrates* Fab. (Lepidoptera: Lycaenidae). M.Sc. Thesis. Department of Agricultural Entomology University of Agricultural Sciences Bengaluru, 2014, 560065.
10. Singh G. Insect pest of other subtropical fruits. Advances-in horticulture fruit crop. 1993; 3:1501-1526.