E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
www.agronomyjournals.com
2024; 7(2): 516-518
Received: 28-12-2023
Accepted: 31-01-2024

Sachin Hiremath
University of Horticultural Sciences, Bagalkot, Karnataka, India

Mutthuraju GP
University of Horticultural Sciences, Bagalkot, Karnataka, India

Tanveer Ahmed
University of Horticultural Sciences, Bagalkot, Karnataka, India

Doddabasappa B
University of Horticultural Sciences, Bagalkot, Karnataka, India

Corresponding Author:
Sachin Hiremath
University of Horticultural Sciences, Bagalkot, Karnataka, India

Influence of season and crop stage on incidence of banana pseudostem weevil, *Odoiporus longicollis*

Sachin Hiremath, Mutthuraju GP, Tanveer Ahmed and Doddabasappa B

DOI: https://doi.org/10.33545/2618060X.2024.v7.i2g.369

Abstract
A study investigating the impact of season and crop stage on the incidence of the banana pseudostem weevil in the Mysuru region of Karnataka revealed that the pest's presence persisted throughout the year. However, two distinct peak periods of infestation were observed: one during August-September and another during March-April. The infestation levels varied from 11.50% to 41.75% regardless of the crop stage. In ratoon crops, the percentage of infestation ranged from 12.00% to 54.50%, whereas in fresh crops, it varied from 11.00% to 32.00%. Notably, the percentage of infestation in ratoon crops was observed to be higher than that in fresh crops. This trend can be attributed to the fact that the banana pseudostem weevil tends to infest crops that are more than five months old. In several fresh crop fields, the infestation levels were negligible or non-existent. The correlation study between various weather parameters and the percentage of infestation revealed consistent findings. Specifically, maximum temperature exhibited a negative correlation with the infestation percentage across all crop stages, while other weather parameters such as minimum temperature, minimum and maximum relative humidity, and rainfall showed a positive correlation with the infestation rate.

Keywords: *Odoiporus*, banana, season, pseudostem weevil

Introduction
Banana stands as a vital staple crop globally, renowned for its affordability and nutritional value, serving as a significant energy and vitamin source in the human diet. India holds a prominent position in banana production, contributing nearly one-fifth of the world's output, with an extensive cultivation area of 8,58,100 hectares and a staggering production of 2,91,62,600 metric tons. Among Indian states, Karnataka emerges as a key player in banana cultivation, boasting an expansive cultivation area of 1,01,530 hectares and an impressive production figure of 24,89,500 metric tons.

The banana pseudostem weevil, *Odoiporus longicollis* considered as monophagous, poses a significant threat to banana crops, capable of causing up to 40% damage. Infestations occurring during the pre-flowering stage can impede flower emergence, while larval tunneling activity leads to stem rot, resulting in weakened and collapsed plant parts. Moreover, these damaged areas create an ideal environment for rot-promoting organisms, exacerbating the harm inflicted on banana plants. Although reports of this pest date back to 1999 in Karnataka (Jayanthi and Verghese, 1999 and Thippaiah, 2010) [2, 5], comprehensive studies on its biology and incidence in regions such as Mysore, a key banana-producing area, remain limited. Thus, this research endeavors to investigate the seasonal incidence of the banana pseudostem weevil and its correlation with weather factors, serving as a crucial foundation for the development of effective management strategies.

Materials and Methods
In Mysuru district of Karnataka, the seasonal incidence of the banana pseudostem weevil, *Odoiporus longicollis*, was investigated. Eight banana fields, comprising four Elakki (Nay poovan) crops and four G-naine crops, were selected for the study. Within each variety, two fresh and two ratoon crops were chosen. Observations were conducted on 50 randomly selected tagged plants in all eight banana fields from April 2018 to March 2019, at fortnightly intervals.

The number of infested plants out of the 50 tagged plants and the number of holes on the pseudostem were recorded during each fortnight. The data from fresh crops and ratoon crops were analyzed separately to determine the seasonal incidence of the pseudostem weevil on each type of crop. Additionally, the data were combined to assess the overall incidence of the pseudostem weevil across all seasons in Mysuru.

Meteorological data, including maximum and minimum temperatures (°C), maximum and minimum relative humidities (%), and rainfall (mm), recorded from April 2018 to March 2019 at the College of Horticulture, Mysuru, were utilized to establish their relationship with pseudostem weevil incidence. Correlation analysis was performed between mean pseudostem weevil infestation data from all eight fields and the corresponding weather parameters for the same period in Mysuru, aiming to understand the relationship between infestation and weather conditions. Moreover, multiple linear regression analysis was conducted to determine the cumulative effect of various weather factors on pseudostem weevil incidence and the extent of variation in infestation explained by these weather factors.

Results and Discussion

The study on seasonal incidence revealed that the pest persists throughout the year, with fluctuations in population and infestation rates across seasons. From April 2018 to March 2019, peak incidences occurred twice at all crop stages. In fresh crops, the first peak incidence was observed from August to September, with the highest infestation percentage recorded during the first fortnight of August (28.00±8.33%), and the second peak occurred during March to April, with 25.00±2.00% infestation. The lowest infestation percentage was noted in January (11.00±4.76%). Similarly, the number of bored holes per plant peaked during August-September and March-April, with 0.77±0.22 and 0.45±0.09 holes per plant, respectively, and reached its lowest in January with 0.16±0.12 holes per plant (Table 1).

In ratoon crops, the first peak incidence was also observed during August-September, with the highest infestation percentage in the first fortnight of August (54.50±4.43%), and the second peak occurred in March-April, with 46.50±6.81% infestation. January exhibited the lowest infestation (12.00±4.90%). Correspondingly, the number of bored holes peaked during August-September and March-April, with 2.53±0.43 and 1.04±0.23 holes per plant, respectively, and reached its lowest in January with 0.20±0.10 holes per plant.

Overall, the peak incidences for the entire crop were observed during August-September and March-April, with the highest infestation percentages during the first fortnight of September (41.75±12.35%) and the second fortnight of March (35.75±12.40%). As with the individual crops, January exhibited the lowest infestation (12.00±4.90%). The number of bored holes followed a similar pattern, peaking during August-September and March-April, with 2.52±0.99 and 0.82±0.36 holes per plant, respectively, and reaching its lowest in January with 0.08±0.10 holes per plant.

Previous studies by Thippaiah (2004) [5] also recorded two peak incidence periods, namely March-May and October-November. This variation may be attributed to changes in climatic conditions and host availability over the years. Similarly, Mohammad Azam *et al.* (2010) [3] observed the peak infestation period from July to September in the Jammu and Kashmir region. Additionally, Priyadarshini *et al.* (2014) [4] noted peak incidence during the second fortnight of August in Bihar, while Devi *et al.* (2015) [1] reported peak infestation in September (4.30%) and lowest infestation in December (0.00%) in West Bengal.

The correlation study between various weather parameters and the percentage of infestation revealed consistent findings. Specifically, maximum temperature exhibited a negative correlation with the infestation percentage across all crop stages, while other weather parameters such as minimum temperature, minimum and maximum relative humidity, and rainfall showed a positive correlation with the infestation rate (Table 2). These results are in line with previous research conducted by Priyadarshini *et al.* (2014) [4], which also noted a negative correlation between maximum temperature and minimum relative humidity (specifically at 7:00 hours) with the infestation percentage.

In the comprehensive cropping scenario, multiple regression models incorporating five weather parameters exhibited significance and yielded relatively robust R^2 values, as depicted in Table 3. Both the percentage of infestation and the mean number of bored holes were well-predicted by these models, with R^2 values indicating a range of influence from 45% to 63%.

Table 1: Seasonal incidence of banana pseudostem weevil, *O. longicollis* on banana from April, 2018 to March, 2019 in Mysuru.

Month	Fresh Crop		Ratoon Crop		Overall incidence		Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	% infestation	Mean number of bored holes/plant	% infestation	Mean number of bored holes/plant	% infestation	Mean number of bored holes/plant	Min.	Max.	Min.	Max.	
April-I	21.50±3.00	0.28±0.05	45.50±6.40	1.81±0.67	33.50±13.64	1.44±0.93	21.50	33.90	38.60	93.80	30.40
April-II	2.00±0.001	0.02±0.001	28.50±11.47	0.63±0.36	15.25±16.03	0.48±0.40					
May-I	8.00±5.89	0.10±0.08	32.50±7.72	0.62±0.34	20.25±14.56	0.26±0.36	20.70	31.40	55.70	96.00	163.30
May-II	9.50±4.43	0.13±0.10	39.75±12.28	1.07±0.23	24.66±18.29	1.04±0.53					
June-I	16.00±7.12	0.21±0.13	38.50±7.72	0.58±0.18	27.25±13.85	0.52±0.25	20.10	26.80	71.30	96.10	67.60
June-II	13.50±7.90	0.18±0.11	47.50±5.00	1.15±0.16	30.50±19.18	1.20±0.53					
July-I	16.00±8.49	0.26±0.18	44.00±8.49	1.01±0.30	30.00±16.90	0.92±0.46	19.60	26.40	68.70	94.90	35.40
July-II	17.00±5.03	0.28±0.10	47.00±5.03	1.30±0.28	32.00±16.70	1.26±0.58					
August-I	28.00±8.33	0.77±0.22	54.50±4.43	2.53±0.43	41.25±15.45	2.52±0.99	19.50	26.00	68.90	95.20	47.30
August-II	27.00±5.03	0.51±0.28	51.50±5.26	1.36±0.19	39.25±13.94	1.44±0.50					
September-I	32.00±4.90	0.54±0.18	51.50±8.85	1.39±0.38	41.75±12.35	1.12±0.53	19.30	29.70	52.40	95.10	158.80
September-II	26.50±6.61	0.34±0.09	54.00±5.16	1.17±0.32	40.25±15.69	1.00±0.49					
October-I	22.00±5.89	0.27±0.09	48.50±4.12	1.21±0.19	35.25±14.93	1.14±0.52	19.50	28.80	54.60	92.00	115.20
October-II	22.00±9.09	0.31±0.19	46.00±7.12	0.96±0.28	34.00±14.89	0.78±0.41					
November-I	19.00±2.00	0.26±0.07	46.00±6.73	0.86±0.18	32.50±15.15	0.86±0.34	18.20	28.20	53.20	92.80	2.40
November-II	19.00±4.76	0.22±0.07	23.50±7.72	0.39±0.14	21.25±6.41	0.28±0.14					

December-I	16.00±2.31	0.21±0.07	23.50±6.40	0.34±0.08	19.75±5.99	0.24±0.10	16.50	28.30	50.60	92.40	0.00
December-II	15.00±3.46	0.17±0.04	21.50±4.12	0.31±0.05	18.25±4.95	0.24±0.09					
January-I	11.00±4.76	0.16±0.12	12.00±4.90	0.20±0.10	11.50±4.50	0.08±0.10	15.00	28.50	34.80	85.70	0.20
January-II	14.00±2.83	0.17±0.04	27.00±6.63	0.40±0.13	20.50±8.40	0.58±0.15					
February-I	20.50±7.55	0.26±0.13	43.00±2.58	0.81±0.06	31.75±13.11	0.86±0.31	18.50	31.60	35.70	86.70	2.20
February-II	19.50±8.06	0.24±0.13	43.00±6.83	0.75±0.21	31.25±14.34	0.60±0.31					
March-I	21.50±4.43	0.31±0.10	42.00±1.63	0.77±0.19	31.75±11.39	0.74±0.29	20.60	34.40	29.50	88.50	178.20
March-II	25.00±2.00	0.45±0.09	46.50±6.81	1.04±0.23	35.75±12.40	0.82±0.36					

Table 2: Correlation of infestation of banana pseudostem weevil on banana with weather parameters in Mysuru.

Crop type	Weather parameters	r	df	Y= a + bx
Fresh crop	Rainfall (mm)	+0.45	20	y = 0.076x + 34.81*
	Maximum temperature (ºC)	-0.05	20	y = -0.2146x + 46.217
	Minimum temperature (ºC)	+0.60	20	y = 3.8418x - 33.429**
	Minimum humidity (%)	+0.35	20	y = 1.2335x - 74.128
	Maximum humidity (%)	+0.38	20	y = 0.2929x + 24.898
Ratoon crop	Rainfall (mm)	+0.15	20	y = 0.0147x + 17.082
	Maximum temperature (ºC)	-0.19	20	y = -0.4398x + 31.025
	Minimum temperature (ºC)	+0.07	20	y = 0.2621x + 13.013
	Minimum humidity (%)	+0.13	20	y = 0.0636x + 14.806
	Maximum humidity (%)	+0.03	20	y = -0.0581x + 23.353
Over all crop	Rainfall (mm)	+0.41	20	y = 0.0509x + 25.745
	Maximum temperature (ºC)	-0.09	20	y = -0.2732x + 37.2
	Minimum temperature (ºC)	+0.43	20	y = 2.0402x - 9.7925*
	Minimum humidity (%)	+0.26	20	y = 0.6269x - 28.8
	Maximum humidity (%)	+0.27	20	y = 0.1669x + 20.603

* Significant at 0.05 level of probability, ** significant at 0.01 level of probability

Table 3: Multiple regression models for infestation of banana pseudostem weevil, *O. longicollis* and weather parameters in Mysuru during April, 2018 to March, 2019.

Crop type	Multiple linear regression model	R^2	F- value	p-value
Fresh crop	$Y= 210.73+ 8.93X_1- 7.69X_2 – 0.95X_3- 0.77X_4+ 0.07X_5$	0.63	5.821	0.003*
Ratoon crop	$Y= 176.62+ 4.77X_1- 7.93X_2 – 1.40X_3+ 0.56X_4+ 0.07X_5$	0.45	2.83	0.05*
Overall	$Y= 198.58+ 6.84X_1- 7.80X_2 – 1.18X_3- 0.11X_4+ 0.07X_5$	0.52	4.35	0.01*

X_1: Minimim temperature (Cº); X_2: Maximum temperature (Cº); X_3: Minimum RH; X_4: Maximum RH; X_5: Rain fall; Significant at p= 0.05

Conclusion

In conclusion, the study on seasonal incidence of the pest indicates its persistence throughout the year, with fluctuations in population and infestation rates across seasons. Peak incidences were observed twice annually, predominantly in August-September and March-April, across both fresh and ratoon crops. These findings align with prior research, indicating the influence of climatic conditions and host availability on pest dynamics. Correlation studies further supported these observations, with maximum temperature negatively correlated and other weather parameters positively correlated with infestation rates. Regression models incorporating weather parameters demonstrated significant predictive capability, suggesting a potential tool for pest management strategies. Overall, this study contributes valuable insights into the seasonal dynamics of pest infestation, crucial for informing effective agricultural practices and pest control measures.

References

1. Devi LL, Ghosal A, Kadam V, Bandyopadhyay B. Banana Pseudostem weevil, *Odoiporus longicollis* Oliver and its population dynamics. Indian Journal of Entomology. 2015;77(1):18-20.
2. Jayanthi PDK, Varghese A. Report of the occurrence of banana weevils in Bangalore. Insect Environment. 1999;4(4):153.
3. Mohammad JS, Tara, Ayri S, Feroz M, Ramamurthy VV. Bionomics of *Odoiporus longicollis* Oliver (Coleoptera: Rhynchophoridae) on banana plant (*Musa paradisiaca*). Munis Entomology and Zoology. 2010;5(2):627-635.
4. Priyadarshini G, Mukherjee U, Kumar N. Biology and seasonal incidences of pseudostem weevil, *Odoiporus longicollis* Oliver (Coleoptera: Curculionidae) in banana. Pest Management in Horticulture and Ecosystem. 2014;20(1):8-13.
5. Thippaiah M, Ashok Kumar CT, Shivaraju C, Chakravarthy AK. Incidence of banana pseudostem weevil, *Odoiporus longicollis* Oliver in South Karnataka. Pest Management in Horticulture and Ecosystem. 2010;16:50-53.