



Incidence of Banana Pseudostem Weevil, *Odoiporous longicollis* Olivier (Coleoptera: Curculionidae) in Major Banana Growing Districts of Northern Karnataka, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A roving survey during 2020-21 was undertaken in different banana growing districts of Northern Karnataka to study the prevalence and the magnitude of the infestation of the banana pseudostem weevil, *O.longicollis* and to know the varietal reaction and preference to the banana pseudostem weevil. Observations of the survey revealed that the districts - wise mean percent infestation varied from 3.73 in Belagavi to 15.35 in Vijayanagar district. The maximum mean percent infestation was recorded in Vijayanagar (15.35) and Kalaburgi (14.67) districts. This was followed by the lowest infestation in Belagavi (3.73) district. The mean per cent infestation varied from 2.50 in the Rajapuri variety to 22.53 in the Sugandhi cultivar across the varieties in different districts. In respect to varieties, Sugandhi banana recorded the maximum level of infestation (22.53) followed by Red banana (22.00), whereas, Elakki recorded 12.53 and 11.33 mean percent infestation in Vijayanagar and Uttara Kannada districts. Grand-Naine was cultivated in all the districts, while redbanana, Sugandhi and Sakkare bale were cultivated only in Kalaburgi and Vijayanagar districts. The mean damage grade index of banana pseudostem weevil across seven varieties in seven districts of North Karnataka revealed highest damage grade index in redbanana (0.98) at Kalaburgi followed by Sugandhi (0.75) in Vijayanagar district. There were statistically significant differences in percent infestation among seven varieties and also among seven districts. Hence, the study highlighted the infestation of banana pseudostem weevil varied in North Karnataka based on the variety, cultivation practices and geographical location.

Keywords: *Odoiporus*; banana; pseudostem weevil; infestation; damage grade.

1. INTRODUCTION

Banana (*Musa* sp.) is the second most important fruit crop in India next to mango. Over nineteen species of insects have been reported to infest banana cultivars (Padmanaban et al., 2001). One important pest is the banana pseudostem borer, *Odoiporus longicollis* Olivier (Coleoptera: Curculionidae) also known as banana stem weevil (BSW). It can cause substantial damage in terms of the production and productivity of bananas. The banana stem weevil is one of the most destructive pests that is widely distributed all over the world, particularly in tropical and subtropical countries. This pest causes extensive stem damage because the banana plantain is propagated by suckers, which are often infected by these pests from the corm region to the entire stem portion of the plants. This results in reduced fruit and bunch size and reduced uptake of nutrients from the entire stem portion, leading to the toppling of plants (Alagesan et al., 2019; Padmanaban et al., 2001). Adult weevils often confine themselves within the pseudostem and also in the decomposing tissues of the infested banana plant. All the life stages of the weevils are present throughout the year, and adult weevils are strong fliers moving from one plant to another for feeding. Through feeding, the larvae move athwart horizontally or in an accumbent direction boring into the core stem along with the inner leaf sheaths (Azam et al., 2010). This pest infestation

has a severe impact on banana production, leading to higher yield losses. The present study was conducted to know the incidence level of the pest. Therefore, this survey to document the incidence and varietal response of banana pseudostem weevil aims to fulfil the knowledge gap to farmers of northern Karnataka by conducting a thorough survey to study the incidence patterns of the banana pseudostem weevil. Additionally, the study aims to explore the preferences of *O. longicollis* towards different banana varieties. Through these efforts, survey aims to provide valuable insights that can serve as a crucial foundation for knowing the incidence level of BPW in northern Karnataka and its impact on banana cultivation.

2. MATERIALS AND METHODS

A roving survey was undertaken in different banana-growing districts of Northern Karnataka during 2020-21 to study the prevalence and the extent of infestation of the banana pseudostem weevil on important banana varieties. The details of surveyed areas are listed in Table 1. In each district, twenty fields were surveyed. In each field, five spots were fixed randomly and observations were made from ten plants in each spot to document the number of infested plants and the percent infestation was worked out by the below- mentioned formula.

Per cent infestation (%) = Total number of infested plants / Total number of plants observed * 100

Table 1. The details of surveyed areas to study the incidence of Banana pseudostem weevil

SI.No	District	Taluk	Name of the Villages	Varieties
1	Vijayanagar	Hosapete	T.B.Dam, Hampi, Kamalapur, Hosur, Hosakoti, Kaddirampur and Chittavadagi	Sugandhi, Elakki and Sakkarebale
		Kampli	Kampli, Bukkasagar, Ramasagar	Sugandhi, Elakki and Sakkarebale
2.	Koppal	Koppal	Mellikeri, Kunikeri, Koppal and Talakal.	Williams.GrandNaine, and Elakki
3.	Uttara Kannada	Sirsi	Kadagoda,Banavasi, Andgigamma, Kuppagadde, Pharsigamma,Unchalli, Gudnapur, Madhuravalliu	Elakki, Grand Naine
4.	Bagalkot	Badami	Badami,Cholachgudda, Belur, S.N.Timmapur, Kulgeri	Williams, Grand NaineElakki and Rajapuri
5.	Belagavi	Gokak	Gokak, Arabhavi, Mudalagi, Kulgod, Buluvala	Grand Naine, Elakki, Rajapuri
		Saudatti	Munuvalli, Savadatti, Ghataprabha, Kallolli ,Konnur, Yaragatti	Williams, Grand Naine, Elakki and Rajapuri
6.	Dharwad	Dharwad	Yettinagudda, Hebballi, Govinakoppa, Gongadikoppa, Kavalageri, Amminabhavi, Benakanamatti, Dandikoppa, Maradagi	Grand Naine,
7.	Kalaburgi	Kamalapur	Kamalapur	Redbanana, Grand Naine

Table 2. Damage grade index of the banana pseudostem weevil

Damage grade	Symptom index
0	Plants with no symptoms on pseudostem
1	Plants with 1 to 10 bored holes on the pseudostem
2	Plants with 11 to 20 bored holes on the pseudostem
3	Plants with 21 to 40 bored holes on the pseudostem
4	Plants with 41 to 60 bored holes on pseudostem
5	Plants with 61 to 80 bored holes on pseudo stem
6	Plants with >80 bored holes on pseudo stem and pseudostem about break or broken

The infestation on pseudostem was recorded by looking into the presence of bored holes and converted to damage grade. The infestation level of pseudostem weevil was assessed on 0-6 damage grade presented in Table 2 following the modified method of Padbhanaban et al. (2009).

Further, mean damage grade index was worked out using the below- mentioned formula.

$$\text{Mean Grade Index} = \frac{\sum DG \times NP}{TP}$$

Where,

DG = Damage Grade
 NP = No. of plants affected in that grade
 TP = Total number of plants observed

3. RESULTS AND DISCUSSION

Survey for the incidence of banana pseudostem weevil (BPW) and understanding its bioecology in banana growing areas of Northern Karnataka and varietal response to weevil. The data on the incidence and damage grade of banana pseudostem weevil in seven districts and different varieties of North Karnataka during 2020-21 are presented in Tables 3 and 4.

3.1 Districts and Variety Wise Per Cent Infestation of Banana Pseudostem Weevil

The infestation of banana pseudostem weevil varied from one location to another based on variety, cultivation practices and geographical positions. The districtwise mean percent infestation varied from 3.73 in Belagavi to 15.35 in Vijayanagar district. The maximum mean percent infestation was recorded in Vijayanagar (15.35) and Kalaburgi (14.67) districts. This was

followed by the lowest infestation in Belagavi (3.73) district. The mean percent infestation varied from 2.50 in Rajapuri variety to 22.53 in Sugandhi cultivar across the varieties in different districts. Concerning to varieties, the Sugandhi banana recorded maximum level of infestation (22.53) followed by the Redbanana (22.00) both were propagated by suckers and rhizomes. The variety, Elakki recorded 12.53 and 11.33 mean percent infestation in Vijayanagar and Uttara Kannada districts. The variety, Grand-Naine was cultivated in all the districts, while Redbanana, Sugandhi and Sakkare bale were cultivated only in Kalaburgi and Vijayanagar districts. There were statistically significant differences in percent infestation among seven varieties and also among seven districts. This suggests that the infestation of banana pseudostem weevil varied in North Karnataka based on the variety, cultivation practices and geographical location.

3.2 Districts and Variety Wise Mean Damage Grade Index of banana Pseudostem Weevil

The mean damage grade index of banana pseudostem weevil across seven varieties in seven districts of North Karnataka was calculated. The mean damage grade index varied from 0.12 to 0.48 in Elakki variety across the districts. Further, it was much lower in Grand -Naine varying from 0.00 to 0.33. In rest of the varieties, the MDGI was less than 0.30 excepting Sugandhi in the Vijayanagar district which recorded 0.75. When the value of the MDGI was compared among the districts, it varied from 0.15 to 0.58. The MDGI was very high (0.98) in redbanana at Kalaburgi. These observations suggest that the MDGI was generally lower in banana varieties tested across seven North districts of Karnataka barring Sugandhi and Red banana varieties.

Table 3. Incidence of banana pseudostem weevil in different banana growing districts of Northern Karnataka during 2020-21

Districts	Varieties (%BPW infestation)							MEAN
	Grand Naine	Williams	Rajapuri	Elakki	Red Banana	Sugandhi	Sakkare Bale	
Bagalkote	5.14	9.00	0.00	6.00	-	-	-	5.03
Belagavi	2.44	-	5.00	3.75	-	-	-	3.73
Dharwad	5.57	-	-	-	-	-	-	5.57
Kalaburgi	7.33	-	-	-	22.00	-	-	14.67
Koppal	1.60	8.00	-	3.00	-	-	-	4.20
Uttara Kannada	0.00	-	-	11.33	-	-	-	5.67
Vijayanagara	12.00	-	-	12.53	-	22.53	14.33	15.35
MEAN	4.86*	8.50*	2.50*	9.72	22.00	22.53	14.33*	7.74
t value	-2.42	-3.90	-10.98	-0.31	-1.72	-1.66	-3.18	
p value	0.026	0.004	0.001	0.348	0.068	0.074	0.009	

Figures in table are the percent infestation based on number of plants infested. * statistically significant at 5% by t-test

Table 4. Damage grade index of banana pseudostem weevil across varieties in different districts of Northern Karnataka during 2020-21

Districts	Damage grade index in different varieties							MEAN
	Elakki	Sugandhi	Grand Naine	Red banana	Sakkare	Williams	Rajapuri	
Uttara Kannada	0.48	-	0.00	-	-	-	-	0.24
Bagalkote	0.16	-	0.16	-	-	0.28	0.00	0.15
Belagavi	0.12	-	0.04	-	-	-	0.09	0.08
Vijayanagara	0.45	0.75	0.33	-	0.20	-	-	0.43
Koppal	0.28	-	0.07	-	-	0.20	-	0.18
Dharwad	-	-	0.19	-	-	-	-	0.19
Kalaburji	-	-	0.18	0.98	-	-	-	0.58

The infestation of banana pseudostem weevil varied from one location to another based on variety, cultivation practices and geographical positions. The maximum percent infestation was recorded in Vijayanagar and Kalaburji districts. The lowest infestation was in Belagavi district. The percent infestation varied from 2.50 in the Rajapuri variety to 22.53 in Sugandhi cultivar across the varieties of the different districts. In respect to varieties, Sugandhi banana recorded maximum level of infestation followed by the red banana. Both were propagated by suckers and rhizomes. The mean damage grade index of banana pseudostem weevil across seven varieties in seven districts of North Karnataka revealed highest damage grade index in red banana (0.98) at Kalaburji followed by Sugandhi (0.75) in Vijayanagar district. The weevil distribution and severity of infestation was influenced by the varieties cultivated, cultural practices, plant protection measures and geographical location in each district. The present findings conform with earlier researchers as Thippaiah et al. (2010) carried out a survey in 15 southern districts of Karnataka and revealed maximum infestation of BPW in Chandrabale (17.66 %) in Shimoga and the lowest in Boodabale (1.60 %) in Kodagu district. Shukla and Kumar (1970) reported a 70 percent infestation of pseudostem weevil on plantains in Uttar Pradesh. Jayanthi and Verghese (1999) and Visalakshiet al. (1989) reported 100 percent infestation in Nendran and Elakki varieties in Kerala. Azamet al. (2010), Anitha and Nair (2004), Janakiraman, 1998 and Gailceet al., (2006) recorded pseudostem weevil for the first time in Poonch and Rajouri districts of Jammu region and recorded 47.00 to 61.20 percent damage with a mean of 54 percent and also they documented that each variety of banana responds differently to the banana weevil depending on the climate and soil condition. and Anitha and Nair (2004) documented a 100 percent loss in Elakki banana and Nendran,

respectively. Further Gailceet al. (2006) reported the maximum incidence of BPW in Nendran variety (93.3%) followed by Poovan (80%), Robusta (66.7%) and Kappa (60 %).

4. CONCLUSION

In the present investigation, the BPW incidence on popular banana varieties grown in major banana growing districts of Northern Karnataka revealed variation in BPW across locations, varieties and cultivation practices. The maximum percent infestation was recorded in Vijayanagar and Kalaburji followed by the lowest infestation in Belagavi districts. Across the varieties maximum percent infestation was recorded in Sugandhi followed by red banana and Elakki. Whereas, the lowest was recorded in the Rajapuri. It was observed in the survey that the infestation level of pseudostem weevil was more in Sugandhi, Red banana and Elakki varieties especially in the ratoon crop. Some of the cultural practices such as leaving the pseudostem of the harvested plants in the field and lack of field sanitation also influenced higher infestation. Further it is going to be concluded that banana pseudostem weevil infestation rates across different places and varieties emphasize the influence of climatic factors and agricultural practices on pseudostem weevil populations. Moreover, the susceptibility of banana varieties to infestation underscores the importance of crop selection in pest management strategies. These findings contribute to our understanding of *O. longicollis* in different parts of north Karnataka and the variety susceptible to pests and offer valuable implications for pest control and banana cultivation practices.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image

generators have been used during writing or editing of this manuscript. COMPETING INTERESTS Authors have declared that no competing interests exist

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