Incidence of bBanana pseudostem weevil, *Odoiporouslongicollis* Olivier (Coleoptera:Curculionidae)in major banana growing districts ofdistricts ofNorthern Karnataka

ABSTRACT

A roving survey during 2020-21was 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 varietalreaction and preference to the banana pseudostem weevilweevil. Observations of the survey revealed that the districts wisedistrict-wise mean per centpercent infestation varied from 3.73 in Belagavi to 15.35 in Vijayanagar district. The maximum mean per centpercent 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 centpercent infestation varied from 2.50 in the Rajapuri variety to 22.53 in Sugandhi cultivar across the varieties in different districts. In respect to varieties, the Sugandhi banana recorded the maximum level of infestation (22.53) followed by the Redred banana (22.00), whereas, 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 Redred banana, 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 the highest damage grade index in Redred banana(0.98) at Kalaburgi followed by Sugandhi(0.75) in Vijayanagar district. There were statistically significant differences in per centpercent 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

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~~ et al. 2001). One important pest is the banana pseudostem borer, *Odoiporuslongicollis* Olivier (Coleoptera: Curculionidae). Also known as banana stem weevil (BSW). It can cause substantial damage in terms of the production and productivity of ~~banana~~ bananas(David 2008). The banana stem weevil *Odoiporuslongicollis* (Coleoptera: Curculionidae) 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*., 2016; 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 anaccumbent 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 fulfill the knowledge gap to farmers of northern Karnataka by conducting ~~an~~ athorough 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, the survey aims to provide valuable insights that can serve as a crucial foundation ~~to know~~for knowing the incidence level of BPW in northern Karnataka and its impact on banana cultivation.

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Material and Methods:

A roving survey was undertaken in different ~~banana growing~~banana-growing districts of Northern Karnataka during 2020-21 to study the prevalence and the extent of infestation of the banana pseudostem weevil (BPW) *O.longicollis*on important banana varieties. The details of surveyed areas are listed in ~~the~~ 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~~below-mentioned formula

$$\text{Per cent infestation (\%)} = \frac{\text{Total number of infested plants}}{\text{Total number of plants observed}} \times 100$$

The infestation on pseudostem was recorded by looking ~~in to~~into the presence of bored holes and the same was converted to damage grade. The infestation level of pseudostem weevil was assessed on 0-6 (table2.) damage grade following the modified method of Padbhanaban *et al.* (2009).

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

Sl.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, Andgigramma, Kuppagadde, Pharsigramma,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

Table2: 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

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

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

Where,

DG = Damage Grade

NP = No. of plants affected in that grade

TP = Total number of plants observed

RESULTS AND DISCUSSION:

Survey for the incidence of banana pseudostem weevil (BPW) and understanding its bioecologyin banana growing areas of Northern Karnataka and varietal response to weevil. The ~~dataon~~ data onthe incidence and damage grade of banana pseudostem weevil, *O. longicollis* in sevendistricts and different varieties of North Karnataka ~~and~~ during 2020-21 are presented in Tables 3 and 4.

Districts and ~~varietywise~~variety wise percent infestation of banana pseudostem weevil

The infestation of banana pseudostem weevil varied from one location to another ~~based on~~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 ~~per cent~~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~~percent infestation varied from 2.50 in Rajapuri variety to 22.53 in the Sugandhi cultivar across the varieties in different districts. ~~In~~ Concerning~~respect to~~ varieties, the Sugandhi banana recorded the maximum level of infestation (22.53) followed by the ~~Red~~red banana (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~~districts. The variety, Grand-Naine was cultivated in all the districts, while ~~Red~~red banana, Sugandhi, and Sakkare bale were cultivated only in Kalaburgi and Vijayanagar districts. There were statistically significant differences in ~~per cent~~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.

Districts and varietywise 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~~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 r~~R~~ed ~~banana~~ bananasat 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.

The infestation of banana pseudostem weevil varied from one location to another ~~based on~~based-on variety, cultivation practices, and geographical positions. The maximum ~~per cent~~percent infestation was recorded in Vijayanagar and Kalaburgi districts. The lowest infestation was in Belagavi district. The ~~per cent~~percent infestation varied from 2.50 in Rajapuri variety to 22.53 in

Sugandhi cultivar across the varieties of the different districts. ~~In~~ Concerning~~respect to~~ varieties, the Sugandhi banana recorded maximum level of infestation followed by the r~~R~~ed banana. Both were propagated by suckers/rhizomes. The mean damage grade index of banana pseudostem weevil across seven varieties in seven districts of North Karnataka revealed the highest damage grade index in r~~R~~ed banana (0.98) at Kalaburgi followed by Sugandhi(0.75) in Vijayanagar district. The weevil distribution and severity of infestation ~~was~~ wereinfluenced by the varieties cultivated, cultural practices, plant protection measures, and geographical location in each district. The present findings ~~are in conformity~~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 ~~per cent~~percentinfestation of pseudostem weevil on plantainsin Uttar Pradesh.Jayanthi and Verghese (1999~~) and~~) andVisalakshi *et al.* (1989) reported 100 ~~per cent~~percent infestation in Nendran and Elakki varieties in Kerala. Azam *et al.* (2010), Anitha and Nair (2004), janakiraman, 1998 and Gailce *et al.*, (2006)recorded pseudostemweevil for the first time in Poonch and Rajouri districts of Jammu region and recorded 47.00 to 61.20 ~~per cent~~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 ~~per cent~~percent loss in Elakki banana and Nendran, respectively. Further Gailce *et al.* (2006) reported the maximum incidence of BPW in the Nendran variety (93.3%)followedbyPoovan(80%),Robusta(66.7%),andKappa(60 %).

Conclusion:

In the present investigation, the incidence of the weevil 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 ~~per cent~~percent infestation was recorded in Vijayanagar and Kalaburgi followed by the lowest infestation in Belagavi districts. Across the varieties, maximum ~~per cent~~percent infestation was recorded in Sugandhi followed by ~~Red~~red banana and Elakki. Whereas, the lowest was recorded in Rajapuri. It was observed in the survey that the infestation level of pseudostem weevil was ~~more~~ higherin Sugandhi, Red banana, and Elakki varieties, especially ~~on~~ inthe 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.

From the observed variations in the survey experiment on the incidence of banana pseudostem weevil, *Odoiporouslongicollis* Olivier in major banana growing districts and varieties of northern Karnataka it is going to be ~~conclude~~ concluded~~that banana~~that bananapseudostem weevil infestation rates across different places and varieties emphasizethe influence of climatic factors and agricultural practices onpseudostem weevil populations. Moreover, the susceptibilityof banana varieties to infestation underscores the ~~importanceof~~ importance ofcrop selection in pest management strategies. ~~Thesefindings~~ These findingscontribute to our understanding of *O.longicollis* in different parts of north Karnataka and the variety susceptible to ~~pest~~ pestsand~~to~~offer valuable implications for pestcontrol and banana cultivation practices.

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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
Kalaburgi	-	-	0.18	0.98	-	-	-	0.58