Uttar Pradesh Journal of Zoology

Volume 45, Issue 21, Page 34-41, 2024; Article no.UPJOZ.4292
ISSN: 0256-971X (P)

Survey on Influence of Cultural Practices on Banana Pseudostem Weevil, *Odoiporus longicollis* Olivier (Coleoptera: Curculionidae) Infestation in Major Banana Growing Districts of Northern Karnataka, India

Venkatesh Hosamani [a*], Venkateshalu [a], Kotikal, Y.K [a], Gangadharappa, P.M [a], Patil D. R [a], Lokesh M. S [a], Ramanagouda, S.H [a] and Doddabasappa B. [a]

[a] College of Horticulture Bagalkote, University of Horticultural Sciences, Bagalkote-587104, India.

Authors' contributions

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

Article Information

DOI: https://doi.org/10.56557/upjoz/2024/v45i214614

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://prh.mbimph.com/review-history/4292

Original Research Article

Received: 05/09/2024
Accepted: 07/11/2024
Published: 14/11/2024

ABSTRACT

The production and productivity of banana is governed by many biotic and abiotic factors. Among biotic factors, incidence of insect-pests is considered as one of the major impedimentin successful cultivation of banana. With respect to the Indian condition around eight pests commonly infest the

**Corresponding author: Email: venkateshhosamani01@gmail.com;*

Cite as: *Hosamani, Venkatesh, Venkateshalu, Kotikal, Y.K, Gangadharappa, P.M, Patil D. R, Lokesh M. S, Ramanagouda, S.H, and Doddabasappa B. 2024. "Survey on Influence of Cultural Practices on Banana Pseudostem Weevil, Odoiporus Longicollis Olivier (Coleoptera: Curculionidae) Infestation in Major Banana Growing Districts of Northern Karnataka, India". UTTAR PRADESH JOURNAL OF ZOOLOGY 45 (21):34-41. https://doi.org/10.56557/upjoz/2024/v45i214614.*

banana crop. However, the banana pseudostem weevil *Odoiporus longicollis* is cosmopolite insect pest that threatens the banana cultivation. The most common management practices followed for managing this pest includes cultural practices. Diverse cultural practices have been communicated to and/or applied by resource-poor households over the past two decades to improve the overall farm health and crop tolerance to biotic/abiotic factors. Therefore, cultural practices are the only measures available to small-scale farmers for the control of banana pseudostem weevil. Hence the survey was conducted during 2020-21 to study the influence of cultural practices on *O. longicollis* infestation in major banana growing districts of north Karnataka. From the survey results on the cultural practices reveals that the pest severity was more severe on ratoon crop fields and the frequency recorded was 37.82%. However, the frequency recorded was 1.68% in first crop, wherein no pest infestation was recorded in main crop. Whereas, good number of farmers could not make a difference in infestation of pest between main and ratoon crop (60.50%) and in such fields infestation level was 4.11%. The banana farmers who were interacted mainly used suckers (36.13%) and tissue culture plants (36.13%) for planting followed by rhizome (24.37%), whereas few farmers used suckers and rhizomes (3.36%) for planting in a single piece of land. Accordingly, the per cent infestation of BPW was less when both tissue cultured plants (4.84%) and suckers (5.53%) used for planting. Whereas, infestation was more severe when both suckers and rhizomes were used (27.50%) on same piece of land and which was followed by rhizomes alone (16.00%).

Keywords: Odoiporus; Banana; pseudostem weevil; frequency.

1. INTRODUCTION

Banana (*Musa paradisiacal* Linn.) is an important fruit crop grown in many tropical and subtropical regions of the world. It is one of the staple edible fruit crop, fifth most important food commodity and fourth most important food crop after rice, wheat and maize in human diet (De Langhe, 1964 and Padmanaban et al*.,* 2001). In different parts of the world bananas are used for cooking purpose and are called as plantains. Banana and plantains both provide greater nourishment for the people. The dessert bananas belonging to the Cavendish group (AAA) are the economically most important cultivars for export trade, whereas the plantain groups (AAB) are important staple food crops in many developing countries (FAO, 1985).

Worlds total banana production is estimated at 125 million tones (FAO, 2025). India is the leading country in banana production in the world with an annual production of 32,454 thousand tonnes and within an area of 880 thousand hectare and that accounts for 26.40 per cent of the world's banana production. Among banana growing states of India, Karnataka stands first with production of 3,713 thousand tonnes from 141 thousand hectare (Anon., 2022).

The different soil types and climatic conditions with good irrigation and some of the river command areas of Karnataka are ideal for banana cultivation. Under favourable conditions, farmers are getting higher yield and revenue from this crop (Krishnan et al., 2020). However, there are many limiting factors, in production and productivity of the crop. One of the major constraints is the high incidence of pests and diseases in the state throughout the year. Agronomical practices in vegetative propagation and year-round cultivation results in persistence of many important pests and diseases.

Banana is subjected to many biotic and abiotic constraints. Among them, the ravage of pests is the prime constraint in the banana cultivation. A total of 470 species of insects and mites are documented to infest banana (Simmonds, 1966 and Ostmark, 1974). Banana is being infested with 19 insect pests from planting to harvesting in India (Padmanaban et al*.,* 2001). Of these, the banana pseudostem weevil (BPW) *Odoiporus longicollis* Olivier (Coleoptera: Curculionidae) is gaining economic importance as a serious pest causing huge losses to the banana grower. It has been a major threat to banana under garden-land cultivation and their occurrence in nontraditional areas of Tamil Nadu (Justin et al*.,* 2008; Kung, 1955). Presently in India, this pest is becoming more problematic and causing severe damage to banana cultivation in Andaman Islands, Uttar Pradesh, Bihar, West Bengal, Assam, Kerala, Tamil Nadu and Karnataka. Of the different states in India, the greater severity was noticed in different banana growing areas of Tamil Nadu, Karnataka and Kerala (Ravi & Palaniswami, 2002, Kavitha et al., 2016 and Krishnan et al., 2015). The pseudostem weevil severity and their infestation level, distribution in South Karnataka

greatly influenced by varieties grown rather than its geographical location (Thippaiah et al., 2010). The *O. longicollis* incidence usually starts from five months old plants. Presence of small pinhead-sized holes with jelly like gummy exudation from these holes and discharge of fibrous material from the base of the leaf petioles are the initial symptoms. During advanced stage, split pseudostem presents extensive tunneling. Due secondary infection by microorganisms damaged stem starts decaying producing offensive odour (Krishnan, 2017). Larval damage at peduncle and stem after flowering, fruits do not develop properly, presenting a dehydrated condition with premature ripening of the bunch. Due to Improper translocation of nutrients and water will affect the growth and development and encourage the susceptibility of the plant to topple or break at the point of weakness. In that case, the loss is 100 per cent (Krishnan, 2017; Padmanaban et al., 2009). It is documented that the pseudostem weevils cause 10-90 per cent yield loss depending upon the stage of the crop and plant protection measures adopted. If the infestation starts during initial vegetative stage (5 months old) causes heavy crop loss. In most of the cases farmers could not identify the incidence of the pest in early stage, which may cause complete loss (Thippaiah, 2004). Padmanaban et al., 2001 and Krishanan et al., 2015).

Though the banana is one of the major fruit crops in different districts of north Karnataka especially in irrigated command areas like Tungabhadra Command Area, Upper Krishna Project etc. no attempts were made to study the influence of cultural practices on this pest infestation, yearlong survival and carryover of pest in successive seasons. Now majority of the banana growing farmers of north Karnataka touching the doors of the universities for the best cultural practices to overcome the incidence of banana pseudostem weevil in north Karnataka. Considering all these points in view a survey on influence of cultural practices on BPW infestation in major banana growing districts of north Karnataka undertaken.

2. MATERIAL AND METHODS

A roving survey was undertaken in different banana growing districts of Northern Karnataka during November and December 2020 to study the prevalence and the magnitude of the infestation of the banana pseudostem weevil, *O. longicollis*on important banana varieties. In each district, twenty farmers' 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

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

The infestation on pseudostem was recorded looking in to the presence of bored holes on the pseudostem. Further, the general information on different cultural practices was collected during survey and their influence on BPW infestation in Northern Karnataka with printed questionnaire with face to face interaction with farmers from each field and frequency percent of farmers opinion during survey was documented (Table 1) as the methodology followed by (Anitha, 2000).

Table 1. Different cultural practices documented during survey with preprepared questionnaire on BPW infestation in Northern Karnataka during 2020-21

Sl.No	Parameters/Cultural practices
1	Variety/clone
2	Total number of plants
3	Age/stage og the crop
4	Cropping pattern i.e., main crop or inercrop
5	Type of planting material- tissue culture, sucker, rhizomes or both sucker and rhizomes
6	Type of crop (Fresh/Ratoon crop)
7	Sucker treatment
8	Organic manures used
9	Fertilizers used
10	Plant protection measures adopted (Prophalactive/ Curative measures)
11	Usage of bioagents (EPF/EPN) and weevil trapping techniques

3. RESULTS AND DISCUSSION

During survey, results reveals that the type of crop as main or ratoon crop was recorded to correlate with BPW infestation. It was observed that the pest severity was more severe on ratoon crop (19.91%) fields and the frequency recorded was 37.82% (Table 2). However, the frequency recorded was 1.68% in first crop, wherein no pest infestation was recorded in main crop (0.00). Whereas, good number of farmers could not make a difference in infestation of pest between main and ratoon crop (60.50%) and in such fields infestation level was 4.11%. Bananan crop is being grown under both drip and surface or by combining both. Among the surveyed banana fields, surface method of irrigation was the most common (53.78%) and drip irrigation was followed in 39.50% of fields surveyed. But in 6.72% of fields both drip and need based surface irrigation was provided. Accordingly, BPW pest infestation was more severe in surface irrigated fields (13.53%), and which was followed by both drip and surface irrigated fields (6.50%) and 5.83% infestation was observed when only drip irrigation was followed. Banana cultivation was more predominent in black soil (59.66%) with more pest severity (12.14%), whereas 40.34% fields were having red soil with 6.88% of BPW infestation (Table 2 and Fig. 1).

Table 2. Influence of cultural practices on BPW infestation in Northern Karnataka during 2020-21

Sl. No.	Parameters	Cultural practices	Frequency (%)	Pest infestation (%)
1	Cropping Pattern	Intercrop	10.08	10.83
		Main crop	89.92	9.92
2	Planting Material	Rhizome	24.37	16.00
		Sucker	36.13	9.53
		Suckers/Rhizome	3.36	27.50
		Tissue culture	36.13	4.84
3	Spacing (ft)	10 x 10	2.52	8.67
		4 x 4	1.68	5.00
		5 x 5	37.82	4.84
		6 x 6	7.56	6.22
		7 x 7	46.22	14.33
		8 x 8	4.20	18.80
4	Pest severity months *	June - July	4.20	13.60
		August- September	21.85	22.54
		October - November	9.24	13.09
		Throughout year	4.20	21.60
		No idea	60.50	3.97
5	Type of cropping	First crop	1.68	0.00
		Ratoon crop	37.82	19.91
		Not sure	60.50	4.11
6	Irrigation method	Drip	39.50	5.83
		Surface	53.78	13.53
		Both D/S	6.72	6.50
7	Soil type	Black soil	59.66	12.14
		Red soil	40.34	6.88
8	Susceptible growth stage for BPW infestation*	After flowering	33.61	19.65
		Before flowering	26.89	11.19
		Not sure	39.50	1.02
9	Usage of bio-gents*	Using	5.04	9.33
		Not aware	94.96	10.05
10	Method of removal of main pseudostem*	Mattocking	35.29	2.42
		No Mattocking	64.71	14.16
11	Sucker treatment*	Yes	45.38	6.40
		No	54.62	13.01

(n= 119 farmers)

**- Based on farmers opinion and awareness*

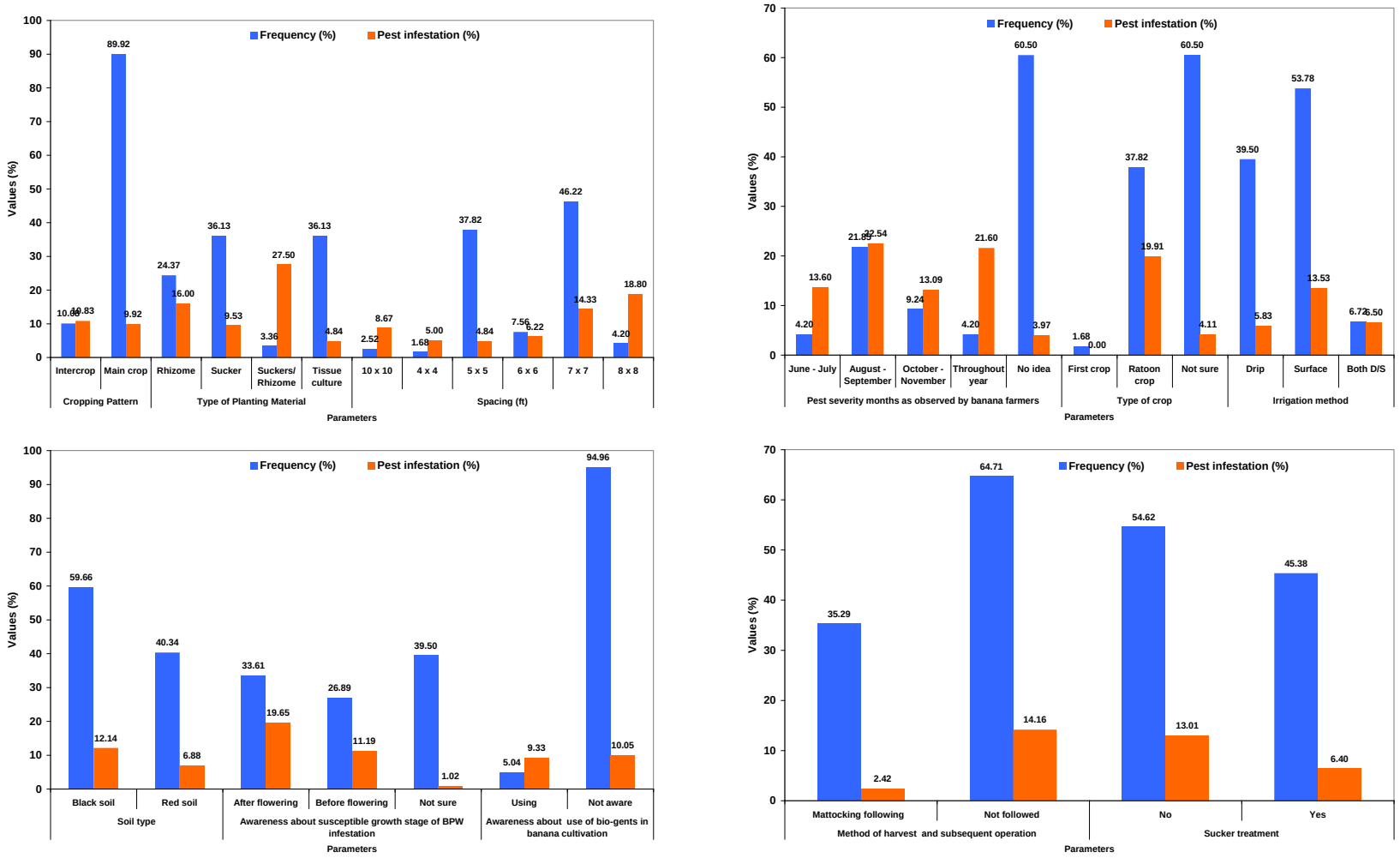

Fig. 1. Influence of cultural practices on *O. longicollis* infestation in northern Karnataka

Farmers awareness about susceptible stage of crop growth for BPW infestation was recorded. More severe infestation was observed (19.65%) after flowering (33.61% fields), whereas, it was 11.19% before flowering stage (26.89% fields). But many farmers could not precisely relate the BPW infestation with that of growth stage (39.50%) as the BPW infestation was less in those fields (1.02%). Among the farmers the awareness about the use of biocontrol agents is very less (94.96%) and only 5.04% were aware. Accordingly, the pest severity was less (9.33%) in fields of farmers who are aware of biocontrol agents. Whereas, the pest severity was more (10.05%) in those fields wherein farmers are not aware of the use of biocontrol agents. Similarly, mattocking was less commonly followed by farmers (64.71%) and such fields had more severe infestation (14.16%). Whereas, a proper mattocking practice was followed in 35.29% fields surveyed and such fields had very less severity (2.42%). Likewise, the sucker treatment was not followed in 54.62% fields and 13.01% BPW infestation was observed. Whereas, 45.38% fields followed the sucker treatment and less severity of pest observed (6.40%) in such fields. During survey it was also found that all the varieties except Grand Naine were cultivated as ratoon as well as a main crop. Some of the varieties were restricted to few areas like Sugandhi and Sakkare bale were cultivated only in Tungabhadra Command area of Vijayanagar district, Red banana was restricted to Kamalapur village of Kalaburgi district. It was observed that banana plants of different age groups in the same field in Hosapete taluk were infested to different infestation levels by the weevil (Table 2 and Fig. 1).

The cultural practices followed for raising the crops has greater influence on incidence of pest. So an attempt was made to document the cultural practices. The banana pseudostem weevil severity was almost the same when the crop as main crop or as an intercrop. Depending on the variety and availability of planting material farmers use rhizomes, suckers or tissue cultured plants. The pest severity was found maximum when farmers use suckers/ rhizomes or rhizome alone. The pest infestation was less when suckers or tissue cultured plants used for planting. A study in Nepal by Tiwari et al. (2006) revealed that the weevil infestation was more with the use of poor sucker, poor crop management practices, sucker treatment and lack of awareness about entomopathogens and trapping techniques. However, Anitha & Nair (2004) reported that variety Nendran suffered the highest level of infestation in all the districts of Kerala followed by Red banana and the clone Robusta an introduced clone in South India, recorded the lowest level infestation. These studies conformity with present studies.

Further the *O. longicollis* infestation increased when spacing increased from 4x4 to 8x8ft. Whereas, 10X10ft recorded relatively less pest population. However, type of cultivar has greater influence than spacing. It has been observed that banana growers have less awareness about the pest and its infestation symptoms, especially when the pest severity was very low. The peak infestation of pest as reported by earlier workers as August-September has been confirmed by banana farmers. Few among them could able to track the pest infestation throughout the year when the pest was high. The present findings are in conformity with the earlier researchers like Nikita et al. (2016) who conducted a survey in major banana growing districts of Tamil Nadu and found that common susceptible cultivar was Nendran with 43.90 % infestation and with 50. 83 % respondents ranked pseudostem borer as number one pest. However, with their face-to-face interviews with banana growers (respondents) about the susceptible stage of crop to pest attack, severity of months and the management practices taken by them and reported that, more than half of the respondents (66.25%) answered that the susceptible stage of crop for *O. longicollis* was above eight months whereas, 19.58% respondents reacted it was during 5-8 months crop. However, nearly 50 percent of the banana growers (48.75%) responded the BPW infestation was severe during the months of October to January followed by medium (35.83%) in June to September and it was low during the months from February to May 15.54%. Further, present studies also inline with Lue et al. (1985) who reported the population density of *O. longicollis* was high from late May to June and September to mid of October that caused heavy damage. Similarly, Zhuo and Wu (1986) also reported two population peaks, one in April to May and other in September to October as the present studies documentation clearly agree with previous findings.

4. CONCLUSION

The investigation clearly indicated that some of the cultural practices greatly influence the BPW infestation in different banana growing regions of northern Karnataka especially the pest

infestation on main crop vs. ratoon crop, Grand Naine vs. Local varieties, Mattocking practices, sucker treatment etc., awareness about trapping techniques, use of bioagents, stage of infestation, severity of months. However, further behavioural studies and biological studies are required in order to arrive clear conclusion. Present study emphasizes the need of interventions for improving pest knowledge and use of ecofriendly tools and public policies should be developed to encourage farmers to change their pest management methods from chemical based to more ecofriendly and sustainable. It is essential to encourage the awareness on biological pest management strategies, knowledge on weevil trapping techniques and insecticides residues in order to make the produce safe both for internal consumption and export of banana.

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.

REFERENCES

Anitha, N. (2000). *Bioecology and integrated management of banana pseudostem weevil Odoiporous longicollis Oliv.* (Ph.D. thesis). Kerala Agricultural University, Thrissur, pp: 120.

Anitha, N., & Nair. (2004). Clonal susceptibility and age preference of banana pseudostem weevil, *Odoiporus longicollis*. *Insect Environment, 10*, 132–134.

Anonymous. (2022). *Annual report of area, production and productivity of banana*. National Horticultural Board, Ministry of Agriculture and Farmers Welfare, India, pp: 146.

De Langhe, E. (1964). Origin of variation in the plantain banana. *Gheut, State Agricultural University, 29*, 45–80.

Food and Agriculture Organization (FAO). (1985). *Production yearbook*. Rome, Italy: Food and Agriculture Organization.

Justin, C., Gailce, L., Leelamathi, M., & Nirmaljohson, S. B. (2008). Bionomics and management of the pseudostem weevil *Odoiporus longicollis* (Coleoptera: Curculionidae) in banana – A review. *Agricultural Review, 29*(3), 0253-1496.

Kavitha, K. J., Murugan, K., & Evans, D. A. (2016). Cytopathological and haematological changes in *O. longicollis* (Olivier) grub by Attinkombu and Thenkaali, the two pest resistant *Musa* cultivars identified in Kerala. *Journal of Entomological Research, 40*, 27–33.

Krishnan, J. U. (2017). *Toxicological studies of bioactive molecules isolated from Cassava (Manihot esculenta Crantz) on Banana pseudostem weevil, Odoiporous longicollis Oliver* (Ph.D. thesis submitted to). ICAR-Central Tuber Crops Research Institute, Aff. to University of Kerala.

Krishnan, J. U., Jayaprakas, C. A., & Lekshmi, N. R. (2015). A review on the biology, distribution and management of *Odoiporus longicollis* Oliver (banana pseudostem weevil). *Thai Journal of Agricultural Science, 48*(4), 207–215.

Krishnan, J. U., Jayaprakas, C. A., Harish, E. R., & Rajeswari, L. S. (2020). Banana (*Musa* spp.) – an unseen umbrella crop? Insect diversity on *Musa* spp. in the Indo-Pacific region. *Oriental Insects, 54*(3), 433–445.

Kung, K. S. (1955). The Banana Stem-borer Weevil *Odoiporus longicollis* Oliv. in Taiwan. *Journal of Agriculture and Forestry, 4*, 80–113.

Lue, L. Y., Luo, Q. C., Yao, X., & Liu, Z. L. (1985). Weevil injurious to banana in Guizhou (China) and their biological features. *Insect Knowledge, 22*, 265–267.

Nikita, S. A., Sridharan, S., & Padmanaban, B. (2016). Analysis of technology gap and relative importance of banana pseudostem borer, *Odoiporus longicollis* (Olivier) in Tamil Nadu. *Indian Journal of Ecology, 43*, 506–511.

Ostmark, H. E. (1974). Economic insect pests of banana. In R. F. Smith, T. E. Mittler, & C. N. Smith (Eds.), *Annual Review of Entomology, 19,* 161–176. Palo Alto, CA: Annual Reviews.

Padmanaban, B., Sundararaju, P., & Sathiamoorthy, S. (2001). Incidence of banana pseudostem borer, *Odoiporus longicollis* (Oliv.) (Curculionidae: Coleoptera) in banana. *Indian Journal of Entomology, 64*, 29–34.

Padmanaban, B., Thangavelu, R., Gopi, M., & Mustaffa, M. M. (2009). Effect of mass multiplication media on sporulation, field efficacy and shelf life of *Beauveria bassiana* against Rhizome and Pseudostem Weevils of banana. *Journal of Biological Control, 23*, 277–283.

Ravi, G., & Palaniswami, M. S. (2002). Evidence for a female-produced sex pheromone in the banana pseudostem weevil, *Odoiporus longicollis* Olivier. *Current Science, 83*, 893–898.

Simmonds, N. W. (1966). *Bananas* (2nd ed.). London, UK: Longmans Green and Co. Ltd. Pp: 512.

Thippaiah, M. (2004). *Pest complex of banana with special reference to bio-ecology and management of pseudostem weevil, Odoipoms longicollis* (Oliv.) (Coleoptera: Curculionidae) (Doctoral dissertation). University of Agricultural Sciences, Bangalore.

Thippaiah, M., Ashok Kumar, C. T., Shivaraju, C., & Chakravarthy, A. K. (2010). Incidence of banana pseudostem weevil, *Odoiporus longicollis* (Olivier) in south Karnataka. *Pest Management in Horticultural Ecosystems, 16*(1), 50–53.

Tiwari, S., Thapa, R. B., Gautam, D. M., & Shrestha, S. K. (2006). Survey of banana stem weevil, *Odoiporus longicollis* (Oliv.) (Coleoptera: Curculionidae) in Nepal. *Journal of the Institute of Agriculture and Animal Science, 27*, 127–131.

Zhuo, S. F., & Wu, X. Z. (1986). Monitoring and control of the banana borer, *O. longicollis* Oliv. *Acta Phytophyceia, 13*, 195–199.

Peer-review history:
The peer review history for this paper can be accessed here:
https://prh.mbimph.com/review-history/4292