

Biology, Ecology and Control of Weevils (Coleoptera: Curculionidae) on Banana from Kolhapur region, India

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ABSTRACT

In Kolhapur G-9 and Deshi varieties of banana *Musa* sp. are widely cultivated and attacked by weevils *Cosmopolitis sordidus* Germer and *Odoiporus longicollis* Oliver (Curculionidae : Coleoptera). The occurrence of *O. longicollis* on above said banana varieties was high from the months of June, September, October, April and May. More or less same trend of occurrence was shown by *C. sordidus*. G-9 variety was more susceptible to weevil attack than Deshi variety. Under laboratory conditions (27±1oC, 75-80% R.H. and 12 hr photoperiod), life cycle from egg to adult was completed with 32 days and 38 days on G-9 variety by *C. sordidus* and *O. longicollis* respectively. Sexes of both species were polygamous and mated at day and night in *O. longicollis* and at night in *C. sordidus*. The dispersal rate of *O. longicollis* was greater than *C. sordidus*. The wind velocity probably has less impact on dispersal on *C. sordidus* than *O. longicollis*. Collection and destruction of weevils, use of noninfected suckers for planting and use of 0.2 % dieldrin spray controlled the weevils at large extent. *Metarrhizium* sp. and Histerid beetles have also caused mortalities in larvae of weevils.

Key words: Banana weevils, biology, ecology, control.

INTRODUCTION

Banana *Musa* spp. is an important fruit commonly grown in tropical and subtropical parts of the world. In Maharashtra, 5, 97,000 ha acres of land is under cultivation of Banana with 65.7 MT/ha productivity. Dwarf Cavendish, Basrai, Robusta, Lal Velchi, Safed Velchi, Rajeli Nendran, G-9, Shreemanti, Red banana etc. varieties are cultivated in Maharashtra. Banana fruits is richest source of energy for humans. In Kolhapur region mostly G-9, Basari, Shreemanti and Deshi varieties are taken. The best time for planting in Kharif season is June-July and for rabi October-November. Banana weevils *Cosmopolites sordidus* (Germar) and *Odoiporus longicollis* Oliver (Coleoptera : Curculionide) are associated with *Musa* spp. of banana. The weevils cause damage to stems and fruit stalks of

banana and affect productivity of the crop. Although 8-10 varieties of banana are recommended for cultivation in Maharashtra, expected yield of the crop is not achieved because of the damage caused by weevils to the crop. Therefore, biology, ecology and control of banana weevils *C. sordidus* and *O. longicollis* have been studied in the present work. Review of literature indicates that Batra (1952), Zimmerman (1968), Isahaque (1978), Shukla & Tripathi (1978), Ram & Pathak (1987), Prasad & Singh (1989), Visalakshi *et al.* (1989), Jayanthi & Verghese (1990), Abraham & Thomas (1995), Padmanaban & Sundararaju (1999), Leather *et al.* (1999), Padmanaban & Sathiamoorthy (2001), Padmanaban *et al.* (2001), Gold *et al.*, (2004), Tiwari *et al.* (2006), Thippaiah *et al.* (2010), Priyadarshini *et al.*, (2014) etc. worked on weevil of banana from India and other parts of the world.

Banana variety	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
G-9 (Hybrid)	+++ (11)	++ 10	++ 11	+++ 12	+++ (10)	++ (2)	- (0)	- (0)	++ 7	++ 8	+++ 10	+++ 11
Deshi	++ 3	++ 3	++ 2	++ 2	++ 2	+ (9)	- 0	- 0	+ (1)	++ (2)	++ (2)	++ (4)

Table 1. Occurrence of *O. longicollis* on Banana in Kolhapur

Sr. No.	Species	Incubation	Larval period	Pupil period	Total time for egg to adult
1	<i>C.comprestes</i>	7 (6-8)	18 (17-20)	7 (6-10)	32 (29-38)
2	<i>O. longicollis</i>	6 (4-8)	24 (21-30w)	8 (6-10)	38 (31-48)

Table 2. Life cycle of weevils on Musa sp (G-9 variety)

MATERIALS AND METHODS

G-9 (Hybrid) and deshi varieties of banana planted in four blocks of Kolhapur have been selected for studying biology, ecology and control of weevils *C. sordidus* and *O. longicollis*. Kolhapur is situated between 15° to 17° North latitude and 23° to 74° East longitude with an average rainfall 1100 mm mostly covered by monsoon and with several water bodies. Hence, environment of Kolhapur is very conducive for cultivation of banana. Occurrence, life cycle, mating, oviposition and damage by weevils on *Musa* spp. (varieties G-9 and deshi) have been studied by spot observations at weekly interval during the years 2013-14. Life cycle was studied with respect to eggs laid and incubation, number of instars and pupae and their duration for development. Adult longevity, mating and oviposition and damage causes by weevils were studied by spot observations in the field. The life cycle was also studied in the laboratory 27±1°C, 75-80% R.H. and 12 hr photoperiod in glass cage 25 x 25 x 25 cm by potting small plant of banana.

RESULTS

Results recorded in tables 1 & 2 and figures 1 to 4 indicated that occurrence of *O. longicollis*(Fig.2) on G-9 (hybrid) variety of banana was high in the months of June, September, November, October, April and May and moderate in the months of July, August, November, February and March and low in December and January. Moderate trend of

occurrence was noted except the month of November and February which was low and no occurrence on the crop was noted in December and January on Deshi variety of banana in Kolhapur (Table-1). More or less same trend of occurrence was showed by *C. sordidus*. The life cycle showed four distinct stages viz. Egg, larva, pupa and adult in both the species and with five, leg less, whitish instars. Pupa was exerate type. *C. sordidus* was dark brown to gray black (Fig.3) with 10-11 mm body length and armed tibiae with hooks while *O. longicollis* was reddish brown. *C. sordidus* was also associated with sugarcane in Kolhapur region. The larvae of *C. sordidus* damaged banana rhizome by boring and making galleries and reducing the nutritional uptake (Figure. 5).

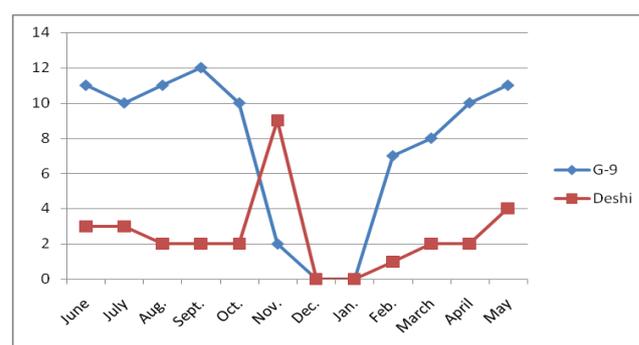


Figure 1. Occurrence of *O. longicollis* on Banana in Kolhapur.

The development of *C. sordidus* and *O. longicollis* studied under laboratory conditions (27±1°C, 75-80% R.H. and 12 hr photoperiod) from egg to adult was completed on G-9 (hybrid) banana variety within 32 days and 38 days

respectively indicating banana as more favorite and suitable host food plant for *C. sordidus*. While, in the field *C. sordidus* taken 4 to 5 weeks and *O. longicollis* 5 to 6 weeks for development. Pre-oviposition periods were 15 days and 20 days in *C. sordidus* and *O. longicollis* respectively. *O. longicollis* mated (Fig.4) throughout the year at day time and even at night but *C. sordidus* mated only at night. In both species the sexes were polygamous. The mated females laid on an average of 47.00 eggs and 62.00 eggs in leaf sheath of banana by *C. sordidus* and *O. longicollis* respectively. Dispersal rate of *O. longicollis* was greater than *C. sordidus*. In rainy season it was low and in summer it was high. Wind velocity have probably less impact on dispersal of *C. sordidus* than *O. longicollis*. *O. longicollis* hardly dispersed for 20 m from releasing spot in banana field.



Figure 2. *O. longicollis* Adult



Figure. 3 *C. sordidus* Adult

The weevils of both the species were controlled by adopting following strategies-

- i) Collection and destruction of adults periodically.
- ii) Planting uninfected suckers.
- iii) Ploughing and digging the field periodically, 3 months interval.
- iv) Histerid beetle was found feeding on larvae.
- v) A fungus *Metarrhizium* sp. caused mortalities in larvae of weevils.
- vi) Treating the crop with 0.20% dialdrin reduced the pest population on the crop.



Figure 4. *O. longicollis* mating



Figure 5. *O. longicollis* Damage

DISCUSSION

A survey of *O. longicollis* on banana crop was conducted by Tiwari *et al.* (2006) by randomly selecting 50 banana growers ten each from Kailali, Morang, Tanahun, Newalparasi and Chitwan districts of Nepal. The survey revealed that majority of Weevils was males (56.5%). The

use of poor suckers, poor crop management practices and heavy uses of chemical pesticides were the casual factors for the weevil infestation in more than five months old banana orchard, particularly in summer seasons. According to them field sanitation and pseudostem trapping utilizing indigenous materials were useful for the sustainable management of banana stem weevil. Zhou and Wu (1986) reported that there were two population peaks of *O. longicollis* in April-May and September-October. Anon (2006) also noted that there was a peak population of 18-20 weevils per plant in July and August and lowest population of 6-8 weevils during November and December. The same trend of population of *O. longicollis* was recorded by Prasad and Singh (1988), Anon (2009) and Myat (2010). According to Priyadarshini *et al.* (2014) the number of holes made by pseudostem weevil was maximum during August 2012 and minimum during December 2012. They concluded that this might be due to the maximum population weevils in rainy season. According to Azam *et al.* (2010) the adults of *C. longicollis* breed throughout the year, though activity slows down during December to February. They further opinioned that being an internal feeder adult became more active during monsoon period i.e. July to September tunneling the pseudostem in the upper parts even upto the bunches.

Leather *et al.* (1999) studied the biology and ecology of the large pine weevil *Hylobius abietis*. The feeding preferences of the adult weevils were highlighted using deterrents as a pest management. *H. abietis* was pest of young conifer *Pinus sylvestris* and the only forest pest for which prophylactic treatment was given in British forests.

Wilson and Millers (1983) studied pine root collar weevils *Hylonius radialis* Buchanan with respect to ecology and management. It is native of eastern North America and also recorded from Canada. Several species of native and exotic pines were attacked by this species. Adult damaged shoots of eastern white scots, Jack and red pines but rarely of eastern white. The pest completed its life cycle in about 2 years. The

adult may continued to live and reproduced 3 overlapping generations in 2 years. They reported that BHC was the best chemical for control of weevil on scots pine.

According to Gold *et al.* (2004) the banana weevil *C. sordidus* was not readily observed in banana fields of Uganda. They noted that the distribution of weevil was influenced by crop management practices and the availability of crop residues. *C. sordidus* was native of Malaysia and Indonesia but found in nearly all banana growing areas of the world (Mau, 1981). According to Mau & Martin (2007) *C. sordidus* completed its life cycle from egg to adult within 30 to 40 days.

Gold *et al.* (2001) reported maximum adult longevity in *C. sordidus* as 4 years while, in the present study it was one year only. Gold *et al.* (2001) also studied the dispersal of this weevil, moving 35 m in 3 days and 60 m in 5 months.

Yin (2010) reported that *O. longicollis* was the most major pest, followed by *C. sordidus* and *Polytus mellerborgi* (Boheman) (Curculionidae) on banana crop in China. In the present study former two species were prevalent with the G-9 (hybrid) and deshi varieties of banana in Kolhapur region but deshi variety was less affected.

According to Roy and Sharma (1952) banana was the main source of carbohydrates with rich in vitamin A, B,C and D containing larger amount of potash, phosphorus, calcium and iron as compared to apple and orange. Therefore, banana crop should be protected from weevils by ecofriendly control measures (Sathe, 2014, 2015). The control measures suggested in the paper will add great relevance for management of weevils.

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