Diversity and Economic Importance of Scarabaeid Beetles of Sindhudurg.

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Abstract

The study on Scarabaeid (Family: Scarabaeidae) was conducted in five talukas -Kudal, Sawantwadi, Malvan, Devgad and Vaibhavwadi of Sindhudurg district in Maharashtra. The study has given the basic idea of the Scarabaeid beetle diversity and their abundance with respect to different regions and the agricultural practices.Total 25 species from 16 genus and 5 sub-families are found in study regions. The *Oryctes rhinoceros* has 10% population composition which is considered as major pest on *Cocos nucifera*. Also this species is observed to be highly active in dung pits and is able to convert raw or partially decayed organic matter in simple form giving it an exclusive importance in agro-economy. Exclusive studies were conducted in Kudal taluka. Public awareness programmes were conducted to sensitize farmers and students about importance of dung beetles and sustainable agriculture.

Introduction

Scarabaeid beetles though well studied ecologically, are quite neglected as agriculture friendly organisms. Pest species are well known from this group. The Australian Dung Beetle Project (1965-1975)[1] has shown promising results of using dung beetles in the farms and pastures increasing plant yield by allowing higher rate of root growth and uptake of nutrient elements[2].

The traditional farming in the mega diverse Sindhudurg district of Konkan involves cattle dung manuring supporting local insect fauna specially the dung beetles and worms useful for agriculture[3]. But this practice has become less popular due to use of chemical fertilizers, which have shown promising growth in agricultural yield at the cost of loss of natural decomposer and biological pest controlling agents[4] beneficial for agriculture with increased cost of farming.

The study was intended to assess the current status of diversity and distribution of scarabaeid beetles. The results will enable us to plan further strategies in line with Australian project. Public awareness programmes were conducted to initialize sensitization and get involvement of farmers and students in the project.

Materials and Methods

Insect collection: Light traps, Pit fall traps using dung as bait, flight intercept traps and hand picking. Dry and wet preservation.

Public Awareness: Theme of program was 'Insects and Sustainable Agriculture', included Poster presentation, public meetings and poster competitions.

Results

In total 25 species were identified, in Scarabaeinae 6 species of tribe Coprini & 6 species of Onthophogini, 4 species of Rutelinae, 4 species of Citoniinae, 3 species of Melolonthinae and 2 species of Dynastinae.

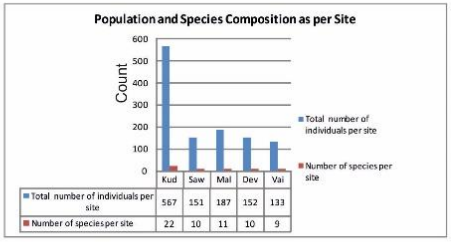
Kudal region harbours 22 species.

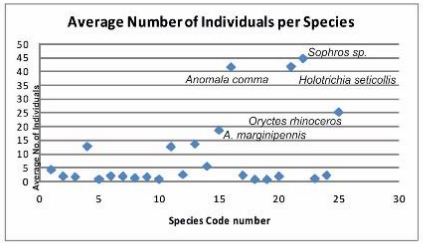
Shannon index(H) Kud>Dev>Mal>Vai>Saw : 2.520>1.857>1.856>1.602>1.585
Menhininck's index(D) Kud>Saw>Dev>Mal>Vai : 0.923>0.837>0.811>0.804>0.780

Sophros sp., Holotrichia seticolis and Anomala Comma show wide distribution and population. These species showed 18.74%,17.48% and 17.40% population composition. *Oryctes rhinoceros* had 10.50% composition.

The agricultural practice study revealed that use of chemical insecticides is more in Vaibhavwadi and Devgad region in orchards and sugarcane farms.

The public awareness programs were attended by 148 farmers and 381 students in 5 sessions.





Discussion

The most species rich area is Kudal where organic practices. Vaibhavwadi has higher forest cover around farm fields as compare to Sawantwadi due to which though there are less number of species in record, the distribution of species slightly even.

Major pest species groups Rutelinae and Melolonthinae are highly concentrated in areas where more or less chemical farming is practised. These might have some resistance to low levels of chemicals. The *Oryctes rhinoceros* found concentrated in areas where dense coconut plantation was done.

Conclusion

- Study shows that there may be a relation between agriculture practices and Scarabaeid species richness in particular area.
- The chemical farming zones have lesser Scarabaeinae fauna. This indicating less role of telecoprid transporters in nutrient cycling.
- The rigorous public awareness about relation of natural agents of nutrient cycling and agriculture. Also after affects of biomagnification needs to be conveyed in chemical farming zones.
- Positive research studies towards preserving scarabaeid fauna (scarabaeinae specially) are needed.

Future Directions

- Application of these Scarabaeid beetles in agriculture is under study.
- Grubs of Rhinoceros beetle (*Oryctes rhinoceros*) could be rear to get the processed dung.
- Initial lab tests revealed that the product is equal in nutrient content as Vermicompost.
- Captive rearing and breeding of these beetles to get fertilizer(Grub Compost).
- Recording more species and study of the community structure all over Sindhudurg.

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Acnowledgements

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Team members at Sindhudurg for tireless devotion for this project.

Potential Utilization of Well Known Coconut Pest Oryctes rhinoceros as Organic Manure Producer for Agriculture in Coconut Producer Zones

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Introduction

This study attempts to estimate the usefulness of Dung beetle *Oryctes rhinoceros* (Insecta: Coleoptera: Scarabaeidea: Dynastinae) in agriculture.

The *O. rhinoceros* grubs (larvae) naturally feed upon dung and organic matter. When fed with organic mixture of dung and decaying plant biomass these grubs produce excreta in pellet form. Also the movement of the grubs converts the dung and biomass to fine porous powder.

The primary analysis have shown that the excreta of the dung beetles is equivalently rich in Nitrogen (N), Phosphorus (P), Potassium (K) and organic carbon (C) as compare to pit compost and vermicompost. The *O. rhinoceros* is major pest of coconut plantation in Kokan region.

The independent survey shows that availability of dung or decaying organic matter may reduce the chances of attack of *O. rhinoceros* on coconut. The known coconut pest could be possibly utilized as organic manure producer.

Methodology

Composting bed was prepared using bricks and cement, the dried leaves, husk and othr organic residues were cut into pieces and dung slurry were added as raw material. allowed to decompose partially for 15 days.

The grubs were collected from open dung pit. *Oryctes rhinoceros* grubs were identified and introduced in the bed (approx. 300 grubs for 500 kg raw material).

The chambers were kept close by wire mesh to avoid escape of grub or adult from unit and water was sprinkled every alternate day to maintain moisture.

After 30 days the analysis of product remained in the composting bed was done by chemical titration and gas chromatography.

Grubs were also released in one vermicompost unit to see whether earthworms and grubs could be raised together.

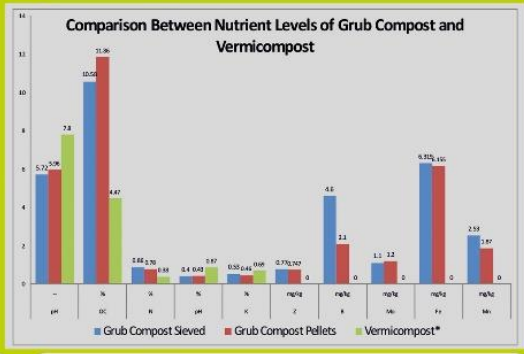
Observations

Grubs feed on the organic matter and move from one place to other in the compost bed. these grubs remain hidden throughout their life cycle.

Grubs took 30 days to convert raw material into final product in the form of pellets and fine powder. After collecting the product and replacing it with new raw material the old grubs were released again. these grubs started feeding.

In the vermicompost unit where the grubs were introduced along with earthworms, the grubs found sharing space with earthworms. The grubs were feeding together with earthworms on raw material added.

it was observed that smaller grubs collected from dung pits remain in feeding stage for 50-150 days. The prepupal and pupal stage may last for 30-50 days. Adult emerges out from cocoon made up of dung or organic matter. Adult lives for 1-3 months feeding on decaying matter. Adults breed and lay eggs in decaying matter.



Results

The chemical analysis of pellets and sieved material from compost unit revealed that Grub compost was richer in Organic Carbon(OC), Nitrogen(N) and micro nutrients. than vermicompost.

The maximum levels of OC and N in Grub compost were 11.86% and 0.86% as compared to vermicompost OC 4.47% and N 0.38%. The Potassium (K) and Phosphorus(P) shows lower values than vermicompost.

The available Micro-nutrient content shows Zinc, Boron, Molybdenum, Iron and Manganese content retained or increased in product.

The *O. rhinoceros* grubs could be raised independently or along with earthworms in vermicompost unit.

The captive rearing is possible for *O. rhinoceros*, captive breeding could be achieved with proper measures.

Conclusion and Discussion

The grubs of *O. rhinoceros* could be used in composting unit similar to earthworms, which could convert partially decayed organic residue in digested, fine compost.

O. rhinoceros grubs are found earthworm friendly and could be utilized in the vermicompost units in combination.

The Grub Compost could be potentially utilized as farm input like vermicompost. As it has few parameters superior as well as few inferior to vermicompost, it can be used in combination with vermicompost.

The Grub compost can be enriched in its nutrient content by providing different raw materials in combination.

The collection of *O.rhinoceros* grubs from open dung pits or infected trees to be utilized in composting would lower down the risk of attack on coconut plantation. Captive breeding in controlled set up could be practiced to get larger number of grubs for composting.

Advantages

The *O. rhinoceros* grubs convert the raw dung and organic residue faster than earthworms. Only 300 grubs could convert 500kg of partially decomposed organic residue in 30 days period. Where as 1000 earthworms initially need to grow in number and process the same quantity of material in 30-45 days period.

Grub compost is rich in nutrient content, easy to transport and hence could be utilized as farm input like vermicompost.

O. rhinoceros being major pest of Coconut plantation. The exploitation of the pest for composed making in controlled units would gradually lower down the risk of attack as adults would not be allowed to get out of the composting unit. Further the captive breeding of these adults could be practiced to get continuous supply of grubs in greater quantities.

The technique of grub composting could be easily adapted in any existing vermicompost unit with existing material and methods without any large investments.

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