International Scholars Journals

Advances in Agriculture and Agricultural Sciences ISSN 2756-326X Vol. 10 (4), pp. 001-005, April, 2024. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Exploring the potential and obstacles of vermiculture practices in Southwest Nigeria

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Received 22 February, 2023; Accepted 26 February, 2023

The prospect of vermiculture in the south-western coast of Nigeria was studied. One hundred and two respondents were interviewed in the three coastal towns of Badagry, Epe and Igbokoda. The results show that 94% of respondents made use of earthworms as fish bait, 37% buy their worms and 57% collected by themselves. The respondents, who buy, however, noted that their suppliers do not breed the worms but search for them from marshy areas. The price value placed on the worms ranged between 0.35 and ₦3.10 per kg; while the most quoted prices were 0.35 and ₦0.80 (16.7% each). The average quoted price was ₦0.70 per kg. Forty-six percent (46%) of respondents were willing to buy earthworms if supplied to them; 49% were willing to serve as sales agents if contacted and 66.7% opined that earthworm was their choicest fishing bait. The results indicate positive expectation for vermiculture as a business venture. Vermiculture should, however, put into consideration the production of *Alma millsoni* and *Libyodrilus violaceus*, the species quoted as the most preferred and effective for fishing. Vermiculture will go a long way in solving the problem of earthworm scarcity among these people, reduce the stress put on natural populations earthworms, thus conserving the worms and also reduce damage done to the soil environment in the course of excavating for worms.

Key words: Vermiculture, earthworm, prospects.

INTRODUCTION

Earthworms, today, are being considered world over in the degradation of waste and as an alternative to inorganic fertilizers. There role in improving soil fertility is well known (Edwards and Lofty, 1977; Owa et al., 2003; Owa et al., 2004a, 2004b). Earthworms have also been suggested by Deolalikar and Mitra (1996) as good substitute or feed supplement for fishmeal in aqua culture.

Deolalikar and Mitra (1996) have used vermicompost prepared from paper mill solid waste for fertilizing aquacultural tanks and found an increase in net primary productivity from 32.08 to 220.83 MgC/m/h. Vermicompost application also facilitates better growth of rohu fish (*Labeo rohita*) when compared with other commercially available organic manures (Deolalikar and Mitra, 1997). There is an increasing demand for protein-rich raw materials in fish and other animal feed industry. Fishmeal is the main protein component of fish feed.

Table 1. Species of earthworms used for fishing.

Earthworm species used	Frequency	Percent (%)
Alma millsoni only	33	37.5
A. millsoni and Libyodrilus violaceus	34	38.6
A. millsoni, L. violaceus and *Eudrilus eugeniae*	1	1.1
L. violaceus only	13	14.8
Unspecified choice	7	8.0
Total	**88**	**100.0**

Earthworm is generally used as bait by the anglers. However, large-scale vermiculture has the potential of supplying earthworm meal as a substitute of fishmeal. The earthworm meal contains all the essential amino acids required in fish feed (Dedeke et al., 2010). The methionine and lysine availability are higher than that of fishmeal.

Vermicomposting and vermiculture technology is applicable to the rural as well as the urban society. It not only helps in commercial aqua-farming but also acts as a convenient source of earthworm for growing ornamental fishes in aquarium. Thus, Vermicomposting can be included as a component of sustainable life-style. Application of vermiculture and vermicomposting in aquaculture is eco-friendly and bio-ethically acceptable (Deolalikar and Mitra, 1997).

Vermiculture, which involves the breeding of earthworms under controlled conditions, has been carried out on species in temperate regions and a few studies have been done in India. Here in Africa, Nigeria in particular, the prospects of vermiculture has not been duly explored, particularly as regarding indigenous species. The present study was therefore carried out to establish a baseline for future works on the prospects of vermiculture in Nigeria, using the coastal areas of south-western states as case study. The research also put into consideration the economic value of the earthworm, which is much needed in the study of the economics of the belowground biodiversity.

METHODOLOGY

The study was carried out in the coastal towns of Badagry, Epe and Igbokoda, southwest Nigeria. This area is characterized by heavy rainfall spanning more than six months of the year and reaching 1200 mm in the months of June and July. Temperature here ranges between 29 and 32°C.

One hundred and two respondents were interviewed, using a structured questionnaire having both multiple choice and open-ended questions. The questionnaire was divided into three (3) sections, with section A addressing the socio-economic characteristics of the respondents. Sections B and C addressed the issues related to knowledge of earthworm types and uses and the culturing and sourcing of earthworms, respectively.

The questionnaires were administered to fishermen along the coastal line of the sampling locations. These areas are well known fishing spots in the study area and are mainly visited by fishermen who are involved in commercial fishing, thus their need for and use of earthworms is believed should be regular.

The data obtained was analysed for frequencies and simple percentage of the earthworm species used by respondents, cost of purchasing earthworms and alternative baits, aside from earthworm, used mostly for fishing by the respondents.

RESULTS

The questionnaires were administered to 46, 25 and 31 individuals at Igbokoda, Epe and Badagry respectively. Almost all the respondents practiced fishing either as full-time or as part-time occupation. Ninety-four percent (94%) of them make use of earthworms as fish bait and the most commonly used species were *Alma millsoni* and *Libyodrilus violaceus* (Table 1). Most of the respondents collected earthworms by self-sourcing (60%), while some 37% both buy and collect earthworms directly. Most collect earthworms on their own because suppliers were scarce and there might be the need to cover long distances in search of suppliers. However, 3% of the respondents do not collect worms themselves but go in search of suppliers. These along with those who both buy and collect noted that they travel long distances in search of suppliers. For instance, some of the respondents in Epe (one of the sampling location) claimed that they go as far as Ibadan, a city which is about 250 km away, in search of suppliers. The respondents, however, noted that none of their suppliers bred earthworms.

Some respondents (46%) showed willingness to buy earthworms if suppliers were available, while some 49% indicated readiness to serve as earthworm sales agent if contacted.

The price range for one kilogram (1 kg) of earthworms was put at between 0.35 and ₦3.10 by the respondents (Table 2). The highest prices quoted were 0.35 and ₦0.80 (16.7% of respondents for each price). The average price was ₦0.70/kg. The most frequent rate of purchase of earthworms by the respondents was twice per week (Table 3). Seventy-three per cent (73%) of respondents picked earthworm as their choicest fishing bait (Table 4) while other baits used for fishing include fish organs, insect larvae, crayfish, small snail, bath soap, etc (Table 5).

Table 2. Prices at which respondents valued 1 kg of earthworms.

Price (₦)	Frequency	Percent (%)
0.01 to 0.35	23	29.7
0.36 to 0.70	17	21.8
0.71 to 1.40	35	44.9
1.41 to 2.11	1	1.3
Above 2.11	2	2.6
Total	**78**	**100.3**

Table 3. How frequently respondents buy earthworms.

Time of purchase	Frequency	Percent (%)
Daily	7	18.9
Once a week	11	29.7
Twice a week	12	32.4
Every fortnight	2	5.4
Once a month	1	2.7
Thrice a week	4	10.8
Total	**37**	**100**

Table 4. Choicest bait.

Choicest bait	Frequency	Percent (%)
Anything available	19	20.7
Earthworms	68	73.9
Fries	1	1.1
Crab	1	1.1
Crayfish	3	3.3
Total	**92**	**100.0**

DISCUSSION

The results show that there is the need to develop the breeding of limicolous earthworm species, particularly *A. millsoni* and *L. violaceus.* There are no literatures indicating any efforts so far on breeding these species of worms. Most commonly used earthworm for culturing is *Eisenia fetida* that has wide range of temperature tolerance, has very high reproductive potential and is less sensitive to density pressure (Watanabe and Tsukamoto, 1976; Tsukamoto and Watanabe, 1977; Hartenstein et al., 1979; Hartenstein, 1981; Reinecke and Kriel, 1981). *Eudrtilus eugeniae,* which is commonly called 'African night crawler', has also been reported as an efficient earthworm to maintain as culture (Kale, 1994). Other species that have been successfully cultured are *Perionyx excavatus* and *P. sansibaricus* (Kale, 1998, 2002). However, these species, except *E. eugeniae* are not found in the West African sub-region, where the present study was carried out. The possibility, though of adapting such species to the tropical climate of this region has not been tested.

Since vermiculture is not expected to serve the fishing industry alone, there might also be the need to ascertain the usability of these species in other areas of need of vermiculture such as waste degradation and vermicomposting. There is, however, the possibility that the reason why these species are widely used in fishing in this area is their availability within the marshy terrains of these communities. Introducing other species of earthworms may not easily attract patronage as locals do not give in to change easily.

Those who travel long distances in search of suppliers claimed the reason is the cumbersome process involved in digging for the worms, while some who collected themselves complained of the cost of transportation if they have to go in search of suppliers. Vermiculture would go a long way in solving these problems, particularly if the vermiculture farmer either supplies the anglers at the harbour or set up the tanks near the fishing harbour. The vermiculture farm also have the benefit of helping to check the problem of habitat destruction done during the process of excavating for earthworms, by both anglers and their earthworm suppliers. This will also go a long way in helping to conserve the natural populations of earthworm, hence the productivity of the soil environment as relating to fertility and water movement.

Conclusion

The science of vermiculture in Nigeria has not been explored because little is known about the biology of our indigenous species of earthworms, particularly regarding reproductive timing and hatching rates. The present research serves as a baseline for intending earthworm breeders. Vermiculture has a viable prospect among the people of south-western Nigeria.

Vermiculture, however, still needs to be explored here by scientists, for information on the biology of the local species, vermicomposting potentials, and the protein content of the individual species need to be known to guide in specifying species to use in feed formation. Scientist equally needs to explore the fields of biotechnology and genetics as a way of developing better varieties of worms taking into consideration:

1. Age at maturity;
2. Number of cocoons produced; and
3. Size of worms.

Conflict of Interests

The author(s) have not declared any conflict of interests.

Table 5. Alternative baits to earthworms.

Bait	Frequency	Percentage (%)
Crayfish	3	3.1
Insect larvae, and adults	6	6.1
Small fishes and fish organs	11	11.2
Amphibian larvae	1	1.0
Bivalve and small fishes	1	1.0
Insect larvae and eba	1	1.0
Amphibian and insect larvae	1	1.0
Insects, small snail and crabs	1	1.0
Snail and small fish	3	3.1
Insects, crabs and amphibian larvae	1	1.0
Small fishes, snails and amphibian larvae	1	1.0
Fish, insects and eba	1	1.0
Insects, eba, amphibian larvae and diatoms	3	3.1
Fish, insects and snails	3	3.1
Fish and eba	2	2.0
Insects, snails and diatoms	11	11.2
Fish and insects	12	12.2
Insects and diatoms	4	4.1
Fish, insect and amphibian larvae	2	2.0
Fish, insect, eba and amphibian larvae	1	1.0
Fish, and amphibian larvae	1	1.0
Fish, insect, eba and snail	1	1.0
Fish, insect, bivalve, amphibian larvae, diatoms and snail	1	1.0
Fish, insect, snail and amphibian larvae	1	1.0
Insects and crabs	1	1.0
Fish and crayfish	6	6.1
Fish, crayfish and crab	3	3.1
Fish and crab	1	1.0
Fish, insect, crayfish, toilet soap and crab	1	1.0
Crayfish and snail	1	1.0
Fish, bread, eba and toilet soap	1	1.0
Fish, eba and toilet soap	1	1.0
Fish, insect, and crayfish	1	1.0
Fish, crayfish and snail	4	4.1
Fish, eba and crayfish	3	3.1
Fish, insect, eba, crab and crayfish	1	1.0
Insect, eba, crab and crayfish	1	1.0
Total	98	100

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