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I am pleased to present this 11th edition of the Journal of Science Education (JOSE) of Federal College of Education, Abeokuta to its numerous readers in the academia. The Journal would facilitate the exchange of ideas aimed at increasing the knowledge and understanding of Science Education.

The articles in this edition, written by emerging and renowned scholars, were carefully chosen in the areas of Applied Science, Science Education, Mathematics Education, Computer Science Education, Physical and Health Education and Agricultural Education. It is believed that the nation's policy makers would make good use of the recommendations in the Journal to uplift the standard of Science Education.

I thank the members of the Editorial Board for their efforts in ensuring the successful publication of this Journal. I am grateful to the Editorial advisers for their support at all times. I also appreciate the academic staff of the School of Science for their contribution towards the success of this Publication.

Thank you and God bless.

Mrs. F. A. Olaore
Editor – in – Chief

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COMPOSITION AND ABUNDANCE OF ARTHROPOD BIODIVERSITY IN ABA-EKU AND APETE DUMPSITES, IBADAN, NIGERIA.

BY
AMUSATA.I[1] AND DR K.O.K. POPOOLA[2].

ABSTRACT

Species composition, abundance and diversity of arthropods in Apete, Aba-Eku dumpsites and control site were examined. Materials used for the collection of sample was pitfall i.e arthropod trap. The pitfall was made of tin of 250g size and was placed in each site with (one third volume level) of 5% formalin inside in order to trap and preserve the arthropods collected from the site. Pitfalls were implanted in each site so as to have adequate representation of the arthropods. Each specimen bottle contains 70% alcohol for preservation of the arthropods harvested before identification. The specimen collected were taken to the laboratory for analysis and identification. Data collected were subjected to statistical analysis, means and percentages were used to determine the values of arthropod. Richness, diversity and abundance were measured by using margalefs specie richness index (D), Shannonweiners diversity index (H) and eveness index (E). A total of 4,763 arthropod were recorded belonging to 17 arthropod orders. The higher percentage abundance of dipterans (Musca domestica) indicated that organic waste materials being deposited on the dumpsites supported the breeding of the houseflies. The results showed that relative humidity and temperature have a greater effect on the abundance of arthropods. The distinct taxa found in Apete and Aba-eku suggested that the organic input from residential areas around the dumpsites has positive effect on the arthropod abundance.

Keywords: Abundance, Arthropods, Biodiversity, Dumpsites, Pitfall, Richness.

INTRODUCTION

Arthropods are joint legged animals with segmented bodies and exoskeleton. The diverse group comprised of the insects, Arachnids (Spider, Mites and scorpion), millipedes and centipedes. There are far more species of arthropods than all other animals put

together(Thompson, 1994). They currently make up nearly 85% of the known species of all organism with new species of arthropods being continually discovered (Cleveland,Hickman and Larry, 1979 ;David, 2009). Arthropods make up the largest most diverse and least understood components of most terrestrial ecosystem. Their extreme variety and small size have enabled them to fill virtually every niche available in this ecosystem.

Traditionally, forest entomologist have viewed arthropods in term of their negative impact on timber production, while less attention has been given to the crucial roles they play in the functioning of the ecosystem (Samuel, 2000). The tremendous adaptive diversity of arthropods has made them all represented in every major habitats, from the ocean floor to the Kitchen wall, from arctic region to the inside of other animals, that is they inhabited every nook and cranny of the earth surface (Valentine, 2004). Arthropods are successful because of their diversity, number of species, wide distribution of variety with habitats, feeding habit and power of adaptation to changing conditions (David, 2009). There are also some structural and physiological patterns that have been helpful to them, such as versatile exoskeleton, segmentation and appendages for more efficiency and better locomotion, presence of air piped directly to cells, highly sensory organs and complex behavioural patterns (Cleveland etal., 1979; Valentine, 2004) .

Arthropods are very useful in the dynamic of our life system. Many of them are important source of food for many animals e.g lobsters Crabs, Crayfish, Shrimps are eaten by human all over the world, some arthropods of order insect are regulated to possess medical properties. An example is Cantharidin which is extracted from the bodies of blister beetles and Meloidea. Cantharidin is a blistering agent having various uses in medical profession (John, 1975; Samuel, 2000). Another preparation known as " Specific medicine apis" is extracted by means of alcohol from the bodies of bees. It is used in "treating hived", diphtheria, scarlet fever and dropsy. Others like drosophilia are very important tool in genetic and physiology researches (Charle's, 1960;Mattingly, Crosskey and Smith 1973; John,1975).

Among other flies which are domestic, many of them are capable of carrying organisms of diseases such as Musca domestica, the housefly is the common carrier of Shigella dysentriae, which produces bacillary in man, Vibrio cholerae which causes cholera, Entamoeba histolytica, the producer of Amoebic dysentery and Salmonella typhosa, the causative organism of thyphoid fever (Charles,1960; Mattingly et al.,1973; and John, 1975). Myriapods are arthropods of immense agricultural and medical importance, they may be beneficial in aiding the breaking down of humus and help to loosen the soil (Thompson , 1994). Myriapods in

class diplopoda such as Blaniulus guttulatus, which has long been regarded as a pest of sugar beet, potatoes, oats , wheat, strawberries and other agricultural crops and fruits (Popoola , 1991).

Open dumps are designated land areas provided by the authority where solid waste being generated and collected from various refuse collection points are finally disposed off (Muraina, 2001) . The offgassing of Methane is generated by decaying organic wastes (methane is a greenhouse gas many times more potent than carbondioxide) and can itself be a danger to inhabitants of an area i.e arthropods and other animals. Bioaccumulation of toxins and heavy metals which can occur on the dumpsite can also reduce the number of arthropods present there (Ogbonna, Ekweozor and Igwe, 2002). Anthropogenic effects in the abiotic environment are likely to influence the distribution of arthropods, through changes in temperature (Convey, Pugh, Jackson, Murray, Ruhland, Xiong and Day, 2002) or changes in precipitation, snow accumulation and water availability (Ellis-Evan and Waltson, 1998). The objectives of this research are to determine(whether the accumulation of Dioxins and Furans resulting from the burning of plastics in the dumpsite will affect the) (i) abundance and diversity of arthropods, (ii) to identify any stress on the dumpsites in which arthropods can serve as bio-indicator and (iii) to examine the effect of weather data like temperature and relative humidity on the arthropod abundance.

MATERIALS AND METHODS

The first study areas (site A) lies in Ona-Ara local government area, Aforuta village at Amuloko area of Ibadan,
Oyo state, Nigeria. Geographically, the study area was located on latitude 7^0 19^1 to 32.27^1 North and longitude 3^0 59^1 to 0^0 47^1 East at an altitude 197 metres (Aluko, Sridhar and Oluwande, 2003). The second study area (site B) is densely populated area called Apete in Awotan-Akufo areas of Ibadan, where the increased population is as a result of siting an institution there, The Polytechnic Ibadan. This area is geographically located on latitude 7^0 27^1 and 45^0 20^1 North and longitude 3^0 50^1 and 55^0 32^1 East. The area was formerly located at the outskirt of the town but people are now building houses very close to the dumpsite. The major source of waste in this neighborhood includes waste from homes, industries like hospital, market waste to mention a few.

The third sampling site (c) used for this study was used as a control site in the Zoology department at University of Ibadan, which is on

latititude 7^{0} 26^{1} and 36^{0} 59^{11} North and Longitude 3^{0} 53^{1} and $44^{0}$$31^{11}$ East. The altitude is about 240metres. The site is a free area from dump and it is a natural environment for organisms. This site was selected to serve as control site for the two dumpsites.

The materials used for the collection of arthropods were pitfall /arthropods trap, specimen bottle for preserving collected arthropods, 70% Ethanol for preservation, 5% formalin for trapping arthropods in pitfall, forceps for picking arthropods, small bowl or beaker for pouring arthropods from pitfall during collection and paper tape for labelling specimen bottles.

SAMPLING PROCEDURES

Ten pitfalls were placed in each site with one third volume level of 5% formalin inside in order to trap and preserve the arthropods collected from the site. Each pitfall was covered with rectangular (pan) lid which was lifted above the pit to allow for entrance of crawling arthropods. Arthropods collected were taken to the laboratory for identification

STATISTICAL ANALYSIS

Data collected were analysed using mean and percentages to determine the order of arthropod collected in the three sampling sites. Weather parameters like (relative humidity and temperature) were determined by Pearson correlation coefficient (r) in relation to arthropod abundance.

RESULTS

The result showed that about 4,763 arthropods were recorded in the three sites.Aba-Eku(site A) had thirty one (31) taxa comprising of 970 individuals, Apete (site B) had twenty four (24) taxa containing 2,846 individuals. Twenty one (21) taxa, 947 individuals were recorded in control site (site C). Percentage arthropod recorded overall were (20.49%) in site A,(59.70%) in site B and (19.90%) in site C respectively (Table 1).

It was also deduced that sixteen identified orders of arthropods were recorded in site A with high percentage in Hymenoptera (39.58%), Diptera (31.03%), Coleoptera (11.65%), Dictyoptera (5.7%),and Araneae (4.2%). The rest orders have smaller percentage values. Abundance of arthropod analysed in site B showed that nine orders were obtained

from the site, order Coleoptera were most abundant with (44.80%), followed by Hymenoptera(6.5%), Dictyoptera (5.9%) and others with lower percentage values (Table 2).

The result also indicated that eleven orders of arthropods were collected in site C. Hymenoptera is most abundant with (40.30%),next order to it is Hemiptera (24.0%), Diptera (6.9%). Low percentages were recorded in the rest orders. Siphunculata, Scolopendromorpha, Spirobolida, Symphepleona were recorded alone in site A with 0.10%, 0.10%, 0.21%,and 0.41%. Except Megalomopha that is represented in site C with(0.11%) and Syphepleona in site B with (0.04%). Order Ixodida were alone represented in site A(1.2%) and site C (0.2%). Polydesmida(3.0%) and Scolopendromorpha(0.4%) were represented in site C (Table 2).

Arthropods are rich in Aba-Eku with (12.63) diverse with (4.41) and evenly distributed with (4.25) followed by Apete with (12.55), (4.16) and (4.05) and finally control site with (5.87), (2.04) and (2.19) respectively (Table 3)

Pearson correlation coefficient (r) relationship between weather data and arthropod abundance are shown in table 4. Relative humidity and temperature have an inverse relationship with arthropod abundance, species richness and evenness of arthropod collected in the three sites. Percentage abundance of arthropods in the three sites are represented in (fig. 1). Hymenoptera has highest percentage in site A, Coleoptera in site B, Dictyoptera and Diptera in A and B, Hemiptera and Lepidoptera in site C. Hymenoptera are well represented in all sites. The other orders shown were graphically lower in percentages.

Table 1: Overall Composition of Arthropods in the Dump sites and Control site

Sites	No of Individuals	No of Taxa	No of Orders
A (Aba Eku)	970	31	16
B (Apete)	2846	24	9
C (Control site)	947	21	11
Total	4763	76	36

Table 2:The overall composition and distribution of arthropods encountered in the three sampling sites.

ORDER	Aba Eku		Apete		Control site			Total %
ARANEAE Species	NO OF INDIVIDUAL	% occurence	NO OF INDIVIDUAL	% occurence	NO OF INDIVIDUAL	% occurence	NO OF INDIVIDUAL	occurence
Eriophora transmarine	11	1.13	07	0.25	04	0.42	22	0.46
Heteropoda maxima	05	0.52	07	0.25	-	-	12	0.25
Rhabidosa rabida	12	1.24	09	0.32	02	0.21	23	0.48
Bothriocyrtum californium	08	0.83	01	0.04	12	1.27	21	0.44
Loxosceles recluse	01	0.10	10	0.35	02	0.21	13	0.27
Atrax robustus	01	0.10	-	-	-		01	0.02
Badumna insignis	01	0.10	05	0.18	04	0.42	10	0.21
Tegenaria agrestis	02	0.21	-	-	-	-	02	0.04
Latrodectus mactans	-	-	01	0.04	-	-	01	0.02
Buthus occitanus	-	-	01	0.04	-	-	01	0.02
COLEOPTERA								
Gonocephalum Costatum	74	7.63	1,263	44.4	01	0.11	1338	28.10
Weisei schil	07	0.72	09	0.32	-		16	0.34
Microlanguria sp	25	2.58	-	-	-	-	25	0.53
Opatropis histida	06	0.62	02	0.07	-	-	08	0.17
Tribolium castaneum	01	0.10	-	-	-	-	01	0.02
Lixus angustatus	-	-	02	0.07	-	-	02	0.04
Euphoria Sepulcralis	-	-	-		26	2.75	26	0.55
DICTYOPTERA								
Blatella Specie	55	5.67	167	5.87	-	-	222	4.66
Dermaptera								
Forficular Auricularia	02	0.21	-	-	-	-	02	0.04
DIPTERA								
Musca Domestica	291	30.0	1089	38.30	54	5.70	1434	30.12
Rhagio Scalipaceus	10	1.03	13	0.46	-		23	0.48
Aedes albopictus	-		-	-	11	1.16	11	0.23
Hymenoptera								
Dorylus nigricares	229	23.6	03	0.11	351	37.1	583	12.25
Componotus Consobrinus	86	8.87	117	4.11	15	1.58	218	4.58
Apis Mellifera	-		-	-	02	0.21	02	0.04
Monomorium mnimum	69	7.11	65	2.29	14	1.48	148	3.11
Hemiptera								
Leptoglossus occidentalis	03	0.31	08	0.28	227	24.0	238	5.00
Isopoda								
Armadillidium vulgare	02	0.21	-	-	-		02	0.04
Ixodida								
Ixodes ricinus	12	1.24	-	-	-		12	0.25
Lepidoptera								
Danaus chrisyppus	24	2.47	27	0.95	06	0.63	57	1.20
Calyptra albivirgata	-	-	-	-	01	0.11	01	0.02
Aglais urticae	-	-	-	-	01	0.11	01	0.02
Orthoptera								
Gryllus bimaculatus	23	2.37	26	0.91	175	18.48	224	4.71
Gryllotalpa latreille	01	0.10	-		-		01	0.02
Scapsipedus marginatus	-	-	02	0.07	-		02	0.04
Stenopola species	-	-	09	0.32	06	0.63	15	0.32
Polydesmida								
Harpaphe haydeniona	01	0.10	-	-	28	2.00	29	0.61
Siphunculata								
Peduculus humanus	01	0.10	-	-	-		01	0.02
Scolopendromorpha								
Scoloperdra giganteon	01	0.10	-	-	04	0.42	0.5	0.11
Megalomorpha								
Missulena occatoria	-		-	-	01	0.11	01	0.02
Spirobolida								
Narceus americanus	02	0.21	-	-	-		02	0.04
Symphypleona								

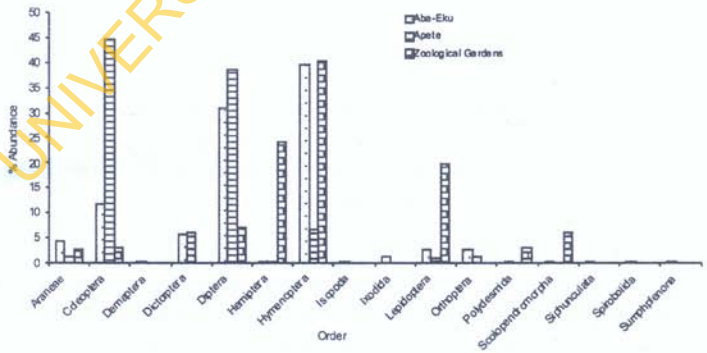
Table 3: Species richness, diversity and evenness of the arthropods collected in the three sites

Months		Total	
Sampling sites	Abk	Apt	Cn
Margalef's Richness Index (D)	12.63	12.55	5.87
Shannon –Weiner Index (H)	4.41	4.16	2.04
Equitability (J) or Evenness (E)	4.25	4.05	2.19

Legend
Abk – Aba Eku
Apt – Apete
Cn – Control Site

Table 4: Pearson correlation coefficient (r) between the arthropod abundance, relative humidity and temperature of the three sites.

	RELATIVE HUMIDITY	TEMPERATURE	ABUNDANCE
Relative humidity	1.00000	-0.51130	-0.17532
Temperatures	-0.51130	1.00000	-0.07673
Abundance	-0.17532	-0.07673	1.00000



% Abundance of order of species found in the three study sites

DISCUSSION

It is obvious from the results obtained in the study that landfills has high percentage abundance and diversity of arthropods which may be as a result of moderate mean temperature between (27-28°C) across the experimental sites, this is in line with Samuel (2000) who reported that there is decrease in orders of arthropods when temperature is extremely high. This results also agrees with Sera (2000) who reported that microorganism functioning in the soil are very active at temperature range between (27 - 32°C)

The highest percentage of Dipterans especially Musca domestica recorded in Apete and Aba Eku dumpsites showed that dumpsites support their breeding. This result agrees with Imai, (1984 and 1985), Dave, Lara, Michael, Derek, Steven and Abolins, (2005) who reported that calyprate flies notably Musca domestica has rising population which are often associated with livestock farm and domestic waste disposal facilities such as dumpsite where the accumulating organic matter provides suitable breeding conditions for a range of species.

Highest percentage Hymenopterans (ants) recorded in Aba-Eku and control sites shows that they are a good pollinators of plant because many of them are collected undersides of plants on the dump site and the control site being undisturbed environment. The lowest percentage Hymenopteran found in Apete also indicated that Apete is more polluted than Aba-Eku. This indicated that low percentage of Hymenopterans could be found in highly polluted areas. This result is related to Patrick and Robert (2012) who reported high diversed group of arthropods which is dominated by Coleopterans,Dipterans and noted the absence of Hymenopterans in horse dung composition communities.

Highest Coleopterans recorded in Apete shows their level of tolerance, Orthopterans and Hemipterans , have highest abundance in control site compared to other two dumpsites, this shows that they can survive better in a natural environment.

Higher percentage of Dipterans is also an indication that the environment is highly polluted especially Apete dumpsites. This is in line with Ahmed(2011) who reported that housefly is the most abundant species and that the occurrence and abundance of the vector is an indication of vector borne disease because dumpsites allow the breeding of these vectors , due to deposition of organic waste and dead organisms. The results is also in line with Onyido, Okolo, Obiukwu and Amadi (2009) who reported that the most abundant arthropod collected were houseflies in their study of survey of vectors of public health diseases in un-disposed refuse dumps in Anambra.

Relative humidity and Temperature have an inverse relationship with arthropod abundance, this is because the average relative humidity

in this study is between (78-80Hg).

CONCLUSION

Generally the result from this study shows that Aba Eku dumpsite had a very diverse arthropod orders which are sixteen in numbers and thirty one (31) species . Control site had eleven arthropod orders and twenty two (22) species, while Apete had 9 orders and 24 species.

The higher percentage of Dipterans collected at the dumpsite have implication on the health of people living very near to the dumpsites because Dipterans are disease vectors that cause yellow fever, malaria, Cholera, typhoid fever e.t.c

In the mean time, organic waste that attract flies should be composted either using backyard composting or standard method of composting in order to reduce the breeding of disease vectors. Further research on the dumpsite is recommended to cover adequately the rainy and dry season. This will help to provide more information on arthropods abundance and also help to solve problems on information of the arthropods occurrence.

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